SCIENTIFIC AMERICAN

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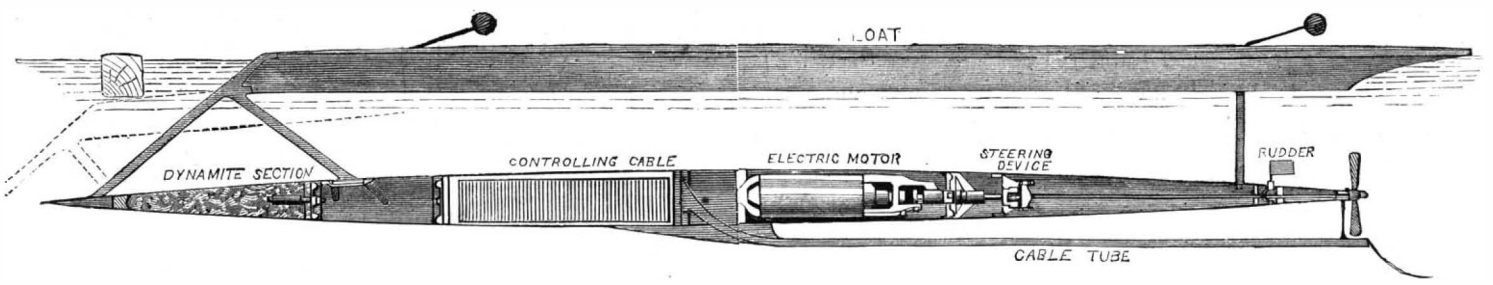
EXPERIMENTS WITH THE SIMS-EDISON TORPEDO.

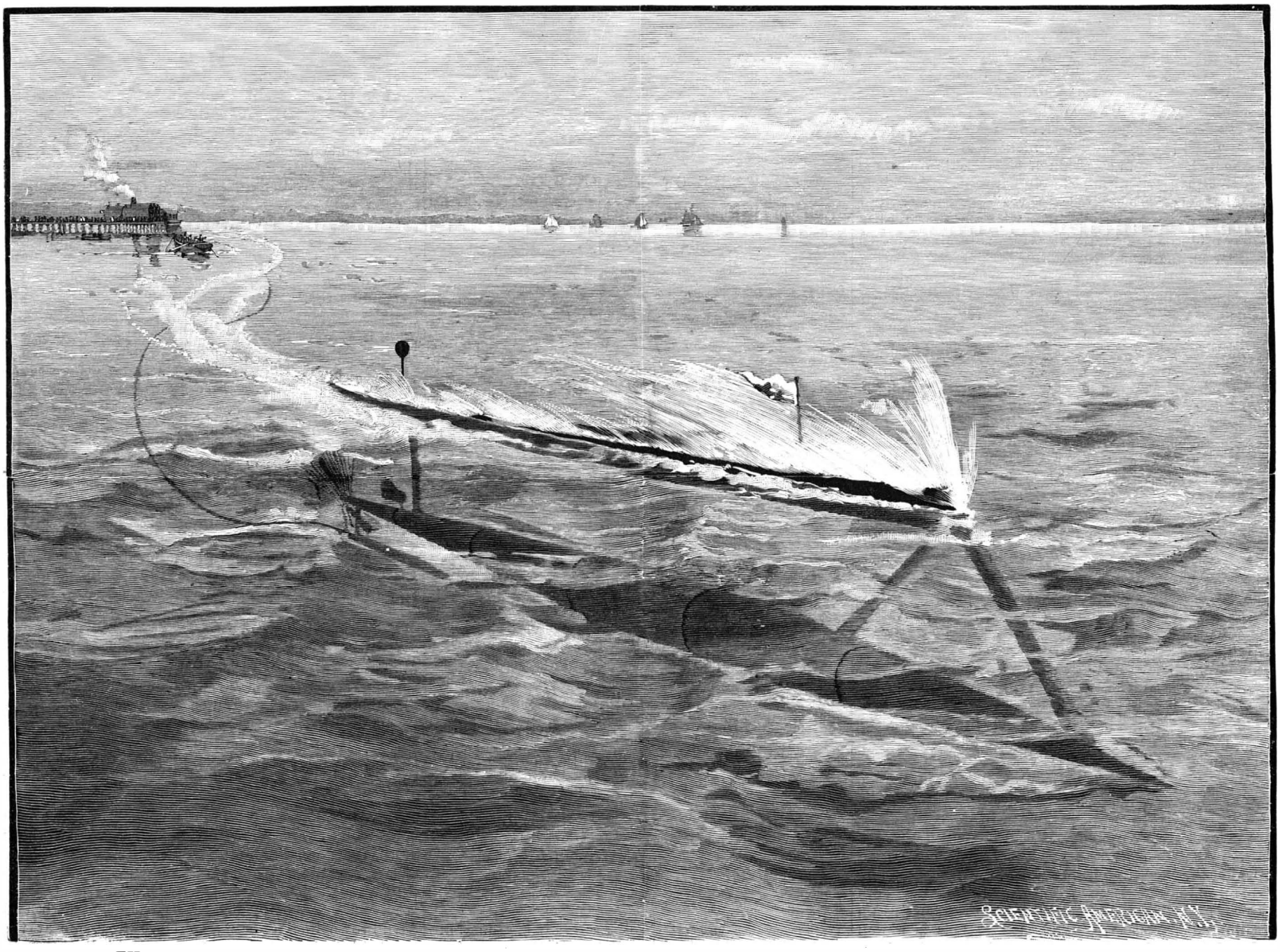
On Tuesday, July 15, an exhibition of the Sims-Edison electric torpedo was given at Willets Point, at the entrance of Long Island Sound, in the presence of a numerous gathering of representative naval and army men and other guests. We have already described and illustrated the general features of the torpedo in this paper, and we reproduce our sectional view of the same in order to recall to our readers' mind its general construction. It consists of a cigar-shaped torpedo and motor case, within which is stowed away upon a reel from one to two miles of controlling cable. The cable is led out through a tube running parallel with the axis of the torpedo and boat to a point aft of and below the propeller wheel. Above the torpedo proper, and rigidly connected thereto, is a float possessing the general outlines of a racing shell, and provided with two sighting poles by which its course can be observed. The hull, if desired, can be filled with cellulose or cork, in order to resist the effects of penetration by shot. In actual trial it has been found to be a very difficult object to hit. The cable is connected to a dynamo at the station, which may be on the shore or in a ship.

The peculiarities of its action as developed by these features may be summarized thus: As the torpedo progresses the cable is fed from out its body. The result of this is that there is no cable to be dragged through the water; the torpedo progresses, but the cable remains stationary, so as not to impede its speed. As the source of electric power is in the station, there is no limit beyond that imposed by the size of the cable and electric motor to the power which may be transmitted. The active explosive agent is contained in the submerged torpedocase, and in advance of the bow of the float. It, therefore, is the first portion to come in contact with the hull of a ship. The instant it touches the hull the motion of the craft will be arrested, and the electric instruments on shore will at once testify to such arrest of its course by the increased mechanical strain put upon the motor, which would at once affect the current. Finally the raking bow connection, which is seen in the illustrations, enables it to give under obstacles. This maneuver has been subjected to a severe test, and the action of the torpedo in this way has been found to be very perfect.

As it was exhibited on Tuesday, it was worked from a shore station as shown. The torpedo was lowered in the water and the current turned on from the switch board. At once the craft started into action, and at a rapidly increasing rate of speed ran out into the stream. Before it stopped it had completed its course of about a mile. Under complete control of the operator on shore, it emerged from the station, and describing a long and circuitous route in the water, returned nearly to its starting point. The mile of distance was completed in about three minutes, indicating the attainment of a very high rate of speed. When in full action the hull became nearly buried, while quite a wave was thrown from the rapidly advancing bow. In some observations it has been noted that the boat went so fast as to run away from the wave it generated. All through its course triangulation observations were taken at exact intervals, in order to determine its speed. These were in charge of the corps of engineers attached to Willets Point.

The torpedo is built in four sections, which can be taken apart or assembled in fifteen minutes; none of the parts weighs more than 500 pounds. The motor at full speed can absorb over 30 horse power available for propulsion. A speed of 22 miles an hour has been obtained by it. The charge of 250 to 500 lb. of high





THE SIMS-EDISON ELECTRIC TORPEDO—THE TORPEDO AT FULL SPEED—SECTIONAL VIEW OF THE TORPEDO.

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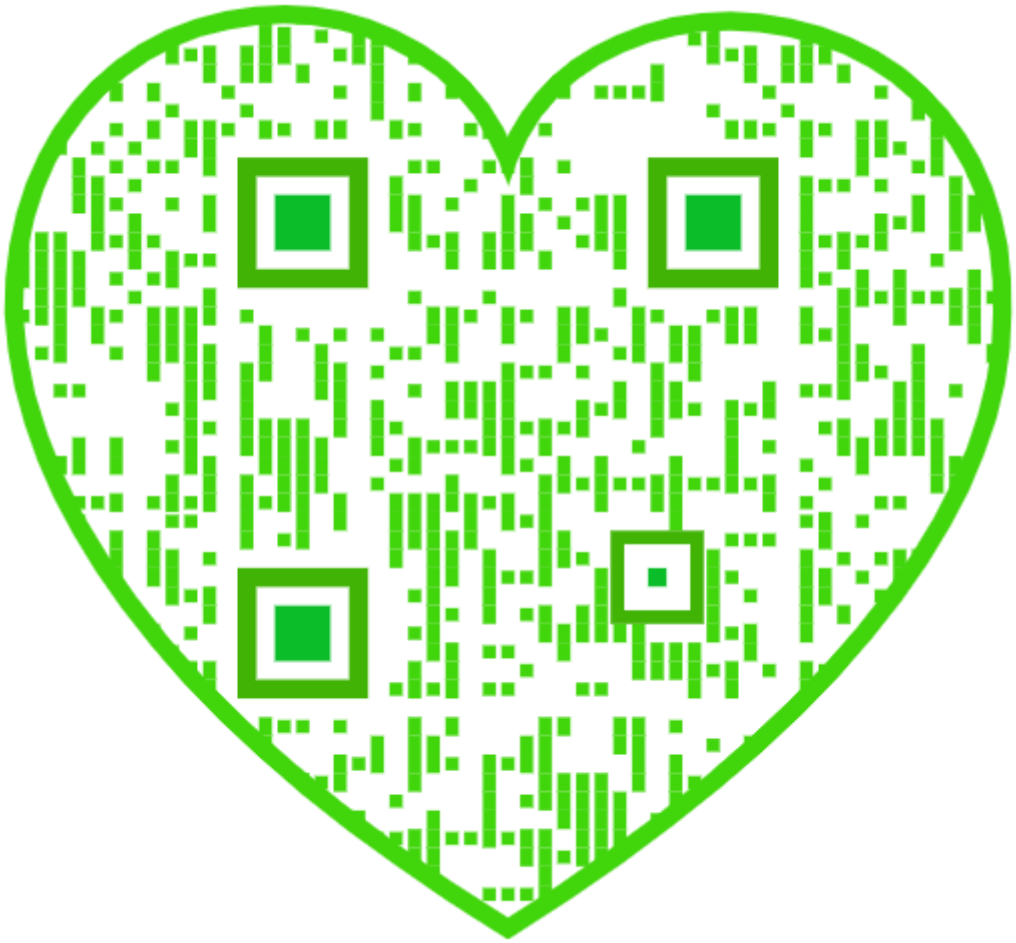

explosive is to be exploded electrically by reversing the current. The steering is also done electrically through the agency of a polarized relay.

Its operation from a shore station is limited in extent by the length of the connecting cable. In the large torpedoes this will be two miles. In operation from a war ship, it is proposed to run two or more boats along a parallel course with the ship and close to it, receiving their motive power from the ship's electric plant. Here, as the ship and torpedoes will all progress alike, and as the electric plant on board can supply power for an indefinite period, the ship and torpedoes can keep company for almost any number of miles. When the enemy is approached the course of the ship can be arrested or its speed can be slackened, and the torpedo sent ahead or to either side at high speed, in order to destroy the enemy. For fort use a special form of casemate with conning tower and other necessary features have been planned by the company. There is little question that a number of these torpedoes could do much to defend New York harbor, at the end of the East River, between Willets Point and Fort Schuyler, and at the Narrows, from entrance by hostile vessels. Our thanks are due to Mr. Everett Frazar, the president of the company, for courtesies received.

A Liquid Volatile Nickel Compound.

Nickel seems destined to startle the modern chemical world. From being a comparative rarity, except on plated goods, it became a common laboratory material but a little while ago, then its title to be considered an element was impugned, and now it is both triumphantly reinstated and its vapor density, for the first time, determined. These results have followed from the researches of Mr. Mond and Drs. Quincke and Langer, which were recently made the subject of a paper before the Chemical Society. The investigation owed its origin to the need for removing carbonic oxide from producer gas, in order to use it in the gas battery described in Mr. Mond's presidential address at the annual meeting of the Society of Chemical Industry last year, nickel and cobalt being found to effect this object.

Working in this direction, it has been found that a direct compound of nickel and carbonic oxide, viz., $Ni(CO)_4$, exists, the new substance being a *colorless liquid*, volatile at ordinary temperatures, boiling at 43° C., having a specific gravity of 1·3185 at 17° C., soluble in alcohol, benzine, and chloroform, and not acted upon by dilute acids and alkalies. Its vapor explodes when heated to 60° C. Its vapor density determined by Victor Meyer's method is 6·01, instead of the theoretical value, 5·9; from this, the atomic weight of nickel is found to be 58. The metal itself can be obtained from it in the form of brilliant metallic mirrors of such purity as to form a splendid raw material for the redetermination of the atomic weight. The mean value obtained by reducing nickel oxide from this source by heating in a stream of electrolytic hydrogen was 58·61, corresponding closely with that previously accepted, viz., 58·52. This proves conclusively that Kruss and Schmidt's assertion that the metal hitherto considered to be pure nickel is contaminated with another element, and that all data concerning it consequently need revision, cannot be sustained, and replaces nickel as we have always known it among the elements.

The constitution of the compound $Ni(CO)_4$ is still the subject of the keenest speculation. Mr. Mond declined to be "drawn" on this point, admitting the temptation to represent it by some fascinating ring formula, but contenting himself at present with a statement of the facts. In connection with this curious body, it is to be noted that no similar cobalt compound can be obtained, thus establishing another method of differentiation and separation between it and its twin brother nickel.

Interesting and Useful Books.

Several years ago the writer, traveling abroad, visited a monastery, and among other curiosities shown him was a series of bound volumes, the sides of which were made of polished boards from the forests of the country, showing the grain of the woods.

At first sight the volumes presented the aspect of bundles of wood. But after a more careful examination it was found that they contain a detailed account of the trees that they represent. On the back, the bark has been detached in order to describe the title of the book by its scientific and its common names.

One of the pages is formed by a broken piece of the wood of the tree, showing its fibers and natural fractures; the other shows the wood when it has been polished and varnished. At one of the ends the fibers are seen as they remain after the passage of the saw, and at the other, the wood finely polished. Upon opening the book, the fruit, the grain, the leafage and other productions of the tree, the moss which generally grows on the trunk, and the insects which live on its different parts are seen. Added to this is a well printed description of the habits of the tree, the places where it grows, and its method of growth.

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IT PAYS TO ADVERTISE IN THE SCIENTIFIC AMERICAN.

In a letter to the publishers of this paper G. M. Robinson, Esq., president of the Charter Gas Engine Company, Sterling, Ill., writes that they are overwhelmed with orders, and that "inquiries from the SCIENTIFIC AMERICAN advertisement are so numerous and from so many points, both foreign and domestic, that we often wonder if there will ever be an end to them."

THE GYPSY MOTH IN MASSACHUSETTS.

The ravages of the gypsy moth (Ocneria dispar) in Massachusetts have been of such a very serious nature that, in March last, the legislature passed a bill creating a commission of three members, who were called upon by the terms of the act to carry into execution all possible and reasonable means and measures to prevent the spreading and to secure the extermination of the pest. Twenty-five thousand dollars was appropriated to defray the expense of the commission, and this sum has been increased by a subsequent appropriation to $50,000.

In June, 1889, several caterpillars were sent to the Hatch experiment station, at Amherst, which is a part of the Massachusetts Agricultural College. Prof. C. H. Fernald, of the Division of Entomology, was absent in Europe, but Mrs. Fernald, who had charge of the entomological work during her husband's absence, immediately designated the insect as the gypsy moth (Ocneria dispar, Linn.) of Europe. In November, 1889, Prof. Fernald issued a special bulletin in which the following interesting facts regarding the history of the moth appear.

The gypsy moth is abundant in nearly all parts of Europe, Northern and Western Asia, and it even extends as far as Japan. In 1817 the cork oaks of Southern France suffered severely from the attacks of this insect. One of the papers of that time stated that the beautiful cork oaks which extended from Barbuste to the city of Podenas were nearly destroyed by the caterpillars of the gypsy moth. After having devoured the leaves and young acorns, they attacked the fields of corn and millet and also the grape lands and fruit trees. In 1878 the plane trees of the public promenades of Lyons were nearly ruined by the same insect. In regard to his personal observations in Europe, Prof. Fernald says: "Only last summer I saw the moths in immense numbers on the trees in the Zoological Gardens in Berlin, where the caterpillars had done great injury; and the European works on entomology abound with instances of the destructiveness of this insect."

Authorities seem to agree in stating that the introduction of the gypsy moth into this country was accidental. In 1870, Mr. L. Trouvelat, a Frenchman residing at Medford, was experimenting with silkworms, and a few of these caterpillars were among the silkworms, and some of them escaped. It is a curious fact that, although the insect has been in this country since 1870, it did not become a pest until last season, and according to the entomologists of the United States Department of Agriculture, had not, up to about March 1, found its way into the collections or been mentioned in the check lists.

One of the first acts of the commissioners appointed to conduct the campaign against the gypsy moth was to advertise for specimens, for the purpose of ascertaining if they were to be found in any other portion of the State than about Medford and Malden. A number of specimens were received, but none proved to be the gypsy moth. It is therefore deemed to be certain that they are only found in this country in the same region where they were originally liberated twenty years ago. The section which has been devastated by them extended last season three miles in length and one in width, but this season the territory has been extended until it is fifteen miles long and four wide.

As the depredations of this insect and the means which are being used to check them are attracting wide attention, the following minute description by Prof. Fernald in its various stages of development may be of interest, especially as the vigorous measures which have been adopted in Massachusetts may result in driving it to other localities.

This insect was first described by Linneus in 1758, in the tenth edition of his Systema Naturæ, Vol. 1, page 501, under the name of *Bombyx dispar*, and while it has retained the specific name of *dispar*, the European entomologists, since the time of Linneus, have given several different generic names, as *Liparis*, *Hypogymna*, *Porthetria*, *Ocneria* and *Psilura*, but I have adopted that given by Staudinger in his Catalogue of the Lepidoptera of Europe—*Ocneria dispar*.

Several different common names have also been given to it in Europe, as the sponge moth, the gypsy moth, the great-headed moth, the fungus moth and others, but I have adopted the one used by the English entomologists—the gypsy moth.

The males are of a yellowish brown color, with two dark brown lines crossing the forewings, one at the basal third, the other on the outer third, somewhat curved, and with teeth pointing outward on the veins,

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The outer ends of all the wings are dark brown. A curved dark brown spot (*reniform*) rests a little above the middle of the wing, and a small round spot of the same color (*orbicular*) is situated between this and the base of the wing, just outside of the inner cross line. A similar spot rests near the middle of the base of the wing. The fringes on the forewings are dull yellowish, and broken by eight brown spots. The antennæ are strongly bipectinated, or feather-like. The forewings expand about an inch and a half.

The females are pale yellowish white, with dark brown cross lines and spots similar to those of the males. The cross lines in both sexes are much darker and more prominent on the forward edge of the wings (*costa*) than elsewhere. In some specimens there is a faint strip of brown across the middle of the wing (*median shade*), and a toothed line across the wing near the outer edge (*subterminal line*). The fringes of the forewings have eight dark spots between the ends of the veins, as in the males, and similar but fainter spots often occur in the fringes of the hind wings. The body is much stouter than in the males, and the antennæ are not so heavily feathered. The expanse of wings is from one and three-fourths to two and three-fourths inches.

The eggs are globular, about one-eighteenth of an inch in diameter, nearly salmon colored, and with a smooth surface. They are laid on the under side of the branches, on the trunks of the trees, often below the surface of the ground where the latter has shrunk away from the tree, and not unfrequently on the fences or on the sides of buildings. They are laid in oval or rounded masses, often to the number of 400 or 500, and covered with ocher yellow hairs from the abdomen of the female. The eggs are laid in the early part of July, but do not hatch till the following spring. The caterpillars remain together, feeding upon the leaves, and when not feeding they habitually rest side by side on the branches and trunks of the trees.

The full grown caterpillar is about an inch and three-fourths in length, very dark brown or black, finely reticulated with pale yellow. There is a pale yellow line along the middle of the back and a similar one along each side. On the first six segments following the head there is a bluish tubercle armed with several black spines on each side of the dorsal line, and on the remaining segments these tubercles are dark crimson red. On the middle of the tenth and eleventh segments there is a smaller red tubercle notched at the top. The whole surface of the body is somewhat hairy, but along each side the hairs are long and form quite dense clusters.

The pupa is from three-fourths of an inch to an inch in length, and varies in color from chocolate to reddish brown. On each side, at the base of the wing covers, is a dark reddish brown, oval, velvety spot. The wing cases are quite broad and reach to the posterior third of the fifth segment. The antennæ cases are strongly curved, and are quite wide in the middle. There are a few yellowish brown hairs on the face and head, also on the first five segments, arranged in broken circles or clusters, which are in longitudinal and transverse rows. The *cremaster* or spine at the posterior end is flattened, rounded at the outer end, grooved longitudinally, and has twelve or more minute hooks at the end.

The first aggressive move of the commission appointed to exterminate the gypsy moth was to send men through the district infested with them, in the early spring before the leaves were out. Where they saw evidences of the eggs, they marked the trees. Then gangs of men were sent around with torches and burned the places which had previously been marked. The torches are made of sheet iron and asbestos, which is saturated with kerosene. The handle of the torch is so arranged that it can be lengthened or shortened as required. One hundred men were employed in this work, and it was carried on vigorously until May 1, when the eggs began to hatch and the burning was no longer of any avail. Then the spraying of the trees with Paris green was commenced. One pound of the powder was put into 150 gallons of water. A hogshead containing this mixture is placed on a dray, and it is drawn by a horse from place to place. Large force pumps are placed upon the hogsheads, and with two men upon the brake and another to stir up the liquid, so that the poisonous element will not all settle at the bottom, the remedy has been very effectually applied. The 10th of July is the date when the cocoons begin to be formed, and in two weeks thereafter the moth appears.

The third line of effort which the commission has pursued is the appointment of inspectors whose duty it is to prevent the moths from being carried from the section where their depredations have become of a serious nature to adjoining regions where they are yet entirely unknown. One hundred men are thus employed. There are two superintendents and one foreman to each gang of five men. The foremen receive $2.50 per day each, and the men $1.75 each. Every street leading out of the gypsy moth region has been covered by these inspectors, and teams leaving the town are all examined by them. These officers carry long-handled dusters with which to brush the insects to the ground, when they are destroyed.

The gypsy moth is reported as feeding upon the leaves of apple, cherry, quince, elm, linden, maple, balm of Gilead, birch, oak, willow, wisteria, Norway spruce, and corn. Many trees in the infested district in Massachusetts have been defoliated, and when the insects in large numbers attack tree or shrub, they generally strip them of their leaves. Entomologists in Europe state that if the insect should get a foothold in this country, it would become a far greater pest than the Colorado potato beetle, because it is prolific and feeds on so many different plants, while the potato beetle confines itself to a small number.

The work of destruction does not appear to be aided by any parasite, as is the case with many other insects, though the United States Entomological Department claims that the insect has a number of natural enemies.

As to the results of the vigorous fight now going on against the gypsy moth, it is probably too early to judge accurately. In reply to a communication, Mr. W. W. Rawson, chairman of the commission which is conducting the campaign, says: "The people say that a great work has been accomplished."

The commonwealth of Massachusetts, by her vigorous effort to stamp out the gypsy moth, has placed the whole country under obligations, for it must be plain, from the facts above presented, that if such measures are not taken whenever and wherever it appears, it is liable to become the most dangerous pest with which we have yet been afflicted.

Dampness.

It is not to be wondered at that the ancients regarded water as one of the elements of which all things are composed; for it is a truth demonstrated by modern chemistry that almost all natural objects contain a large proportion of water. Not only the plants that drink the summer showers, and show by their juicy succulence that they have incorporated the liquid streams into their substance, but the very soil in which these plants grow, and the solid rocks themselves, contain a large proportion of water. And, when we take away from animals, and even from man himself, the water which they contain, the amount of solid residue left behind is surprisingly small. It is true that, in all these cases, our senses give evidence of the presence of water, and do not require the corroborative testimony of chemical analysis. The moisture adhering to soil and to rocks, the juice of plants, and the blood and other fluids present in animals, all evidently acknowledge water as one of their chief constituents and testify plainly to the presence of this liquid. But if we were to suppose that water is always absent from those substances which to our senses give no evidence of its presence, we should commit a great mistake. The dry and solid rock consists largely of water; and clay, though baked in the summer sun and dried in the summer breeze, cannot be robbed of all its moisture. When the washerwoman buys fourteen pounds of transparent and apparently perfectly dry soda, she in reality pays for nine pounds of water, and gets but seven pounds of real soda, instead of the fourteen that she supposes she is getting. In short, water is present everywhere—in the dry wood that has for years formed our furniture, and even in the apparently perfectly dry dust that blows about our streets. Even the air, on a dry and sultry day when everything is parched and when every breath seems to burn our throats, is charged with moisture. That warm and apparently dry air contains moisture is easily proved. An ice pitcher becomes covered with dew, not because the pitcher *sweats* through from the inside as it is said to do, but because the water held in suspension by the hot air, even when apparently dry, contains a considerable amount of moisture. Procure a small quantity of salt of tartar, a cheap drug that may be obtained from any apothecary, and, on a dry day, lay it on a common plate, and expose it to the atmosphere. In a short time it will have attracted from the air an amount of water sufficient to dissolve it, and it will have become converted into an apparently oily liquid, called by the old chemists who did not fully understand the changes that take place, oil of tartar. The experiment will be more convincing, perhaps, if the salt with its containing vessel—which in this case, however, should be as light as possible—be placed in the pan of a moderately delicate pair of scales, and carefully counterbalanced. In this case, the abstraction of the moisture from the air is rendered evident by the gradual increase in the weight of the salt and the descent of the pan in which it is placed.

If, then, moisture may be regarded as everywhere present, it becomes a nice point to determine when anything, such, for example, as the air we breathe, our houses, beds, clothes, etc., may be considered damp. To look for perfect dryness would be a vain search; nor would it do us much good if we could find it. Perfectly dry air would remove the moisture from our bodies so rapidly that we should wither as if smitten with the blast of the simoom. In such an atmosphere, our throats would be parched as if in an oven, plants would wither; and nature become one universal desert. But, on the other hand, air that is too moist—that is to say, air that is really damp—produces effects that are equally disastrous. In such an atmosphere, metals rust or corrode, vegetable matters rot, and the growth of fungi, such as mildew, mould, etc., is greatly promoted. Air in this condition is universally regarded as unwholesome; and it consequently becomes an important practical question to determine when our dwellings are really damp, and to distinguish between this condition and that in which bodies may be considered as ordinarily and properly moist. Theoretically, the question is one that is not easily solved; but practically, it is not so difficult. Let us consider the case of the air; and find out, if we can, what the conditions are in which it may be said to be damp.

When perfectly dry air is brought into contact with bodies containing water in a free state, there instantly begins a strife for the possession of the liquid. Since water evaporates at all temperatures, even when it is frozen solid, the air surrounding the moist body becomes loaded with vapor, and, as it then gradually mixes with the air in its neighborhood, its place is supplied with drier air, until the whole air contained in the room or vessel has been saturated with water. The point at which this saturation occurs depends chiefly upon the temperature of the atmosphere. On a warm day the air is dry, not because there is little or no water present in it, but because, owing to its high temperature, it is capable of receiving and retaining a considerable additional quantity of moisture. In other words, air and everything else is capable of holding in its substance a certain definite quantity of water. If the amount of water present is so great that it appears in the form of moisture, or if the proportion even approaches the limit which the body is capable of holding even before it becomes evident to our senses, we call it damp. Absolute dryness, then, is to be carefully avoided, and so is that degree of moistness in which objects part easily with the water which they hold. The evil effects of the first condition are to be seen in the dry and oppressive condition of an atmosphere heated by a stove or furnace; the results of an excess in the opposite direction are most clearly seen in unwholesome basements and damp and malarious cellars. The best means of determining and regulating the amount of moisture in our dwellings is an important one.—*The American Engineer.*

Food from Wood.

Probably no modern science presents a wider field for speculation than that of chemistry, and more especially, perhaps, that branch of the science which treats of organic compounds. Since the day when Wohler overthrew for ever the notion that organic substances were exclusively the products of the operation of a so-called vital force, by his discovery of the synthesis of urea, a great number of bodies, hitherto obtained only in nature's laboratory, have been successfully built up as the result of a careful and most minute study of their exact nature. The discovery of the preparation of substances by artifice, more particularly the dyes, has, as a matter of course, influenced very considerably home and foreign industries. What shall be said, then, when chemistry promises to solve hard problems of political and social economy?

In an address delivered at Heidelberg, by no less eminent an authority than Victor Meyer, it is announced that "we may reasonably hope that chemistry will teach us to make the fiber of wood a source of human food." What an enormous stock of food, then, will be found, if this becomes possible, in the wood of our forests, or even in grass or straw. The fiber of wood consists essentially of cellulin. Can this be made to change into starch? Starch has exactly the same percentage in composition, but, as every one knows, it differs very much in its properties, and the nature of its molecule is probably much more complex. Cellulin is of little or no dietetic value, and is not altered, like starch, in boiling water. It readily gives glucose when treated with sulphuric acid, as is easily shown when cotton wool, which is practically pure cellulin, is merely immersed in it. Starch gives the same product when boiled with weak acid.

The author further quotes the researches of Hellreigel, which go to show beyond dispute that certain plants transform atmospheric nitrogen into albumen, and that this process can be improved by suitable treatment. The production, therefore, of starch from cellulin, together with the enforced increase of albumen in plants, would, he adds, in reality signify the abolition of the bread question. It must be borne in mind, however, that theory, fascinating and promising though it may be, is not always capable of being followed up by a practical result.—*Kuhlow.*

Population of New York City.

The first or preliminary official returns of the census of 1890 give 1,513,501 as the present population of the city of New York, being an increase of a little more than 25 per cent within ten years. One million two hundred and six thousand two hundred and ninety-nine was the population in 1880.

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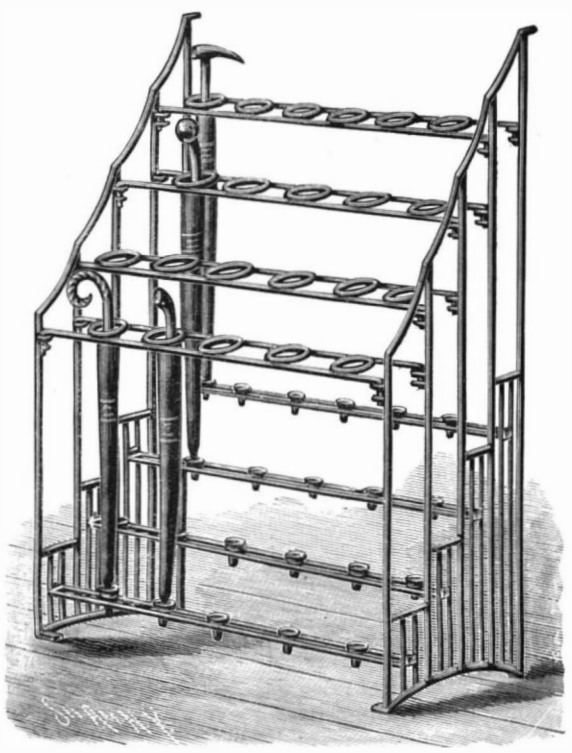
AN IMPROVED UMBRELLA OR PARASOL EXHIBITOR.

This is a light, strong and portable exhibitor for facilitating the display of a number of umbrellas, parasols, canes, etc., permitting free access to any of them, while the device may be quickly separated into



KNISELY'S UMBRELLA OR PARASOL EXHIBITOR.

parts which can be closely packed for transportation. It is a patented invention of Messrs. Abraham Y. and John P. Knisely, of Steelton, Pa. The device may be made in either rectangular or circular form, though the former style only is shown in the illustration. It has two similar side frame sections connected together at their lower ends by arched foot pieces, and at their graded upper ends by inclined top rails of undulating form. Between each adjacent pair of the upright bars are horizontal braces at graded intervals of height, the lowest braces being in front and the highest at the rear. From each horizontal brace two parallel guide strips are downwardly extended and attached by their lower terminals to the foot pieces, the guide strips receiving and supporting movable transverse socket-supporting bars, each socket bar being elevated above the one preceding, considered from front to rear. To afford support for the upper ends and lateral braces for the structure, composite cross bars are provided, each composed of two rods held in the same plane by a number of rings, each ring being located directly over a socket when the parts of the frame are assembled. The ring bars are attached to the frame by depending hooks fitting in eyes on the upright rods.

BOLT THREADING MACHINE.

The Wiley & Russel Manufacturing Company, of Greenfield, Mass., have recently brought out a bolt threading machine which we herewith illustrate. It is a machine for threading bolts and pipe and for tapping nuts, to which can be attached a cross slide and tool rest for cutting off stock. Fig. 1 shows the plain machine having back gears which can be thrown in or out as in a lathe, with a hollow spindle. The dies are carried in two equal wheels set side by side controlled by a right and left screw, each die being divided, the half in one wheel opposite the half in the other, so that a complete meshing die is made by bringing the wheels together, and the finished screw released by separating them, thus saving running back over the threads.

Fig. 2 shows the same machine with the cutting off attachment added, and has also a screw attached to the carriage passed through the bed underneath the head of a nut driven from the spindle by change gears. By putting on the proper gears, greater accuracy of pitch can be secured in cutting screws than is possible when dependence is placed on the die alone. An extra chuck on the back end of the spindle is provided for holding firmly long work, as in cutting off stock. The back of both machines forms a cupboard for the reception of dies, etc., not in use, and with both is furnished a countershaft with friction clutches.

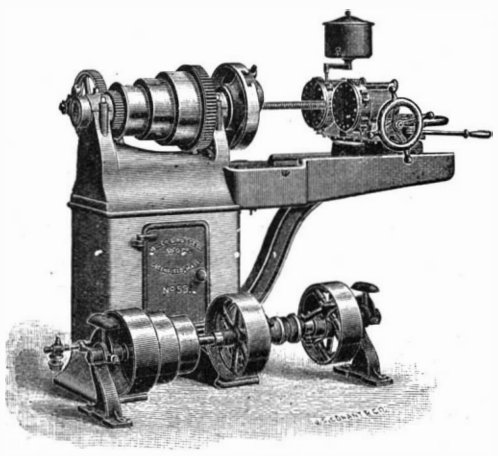
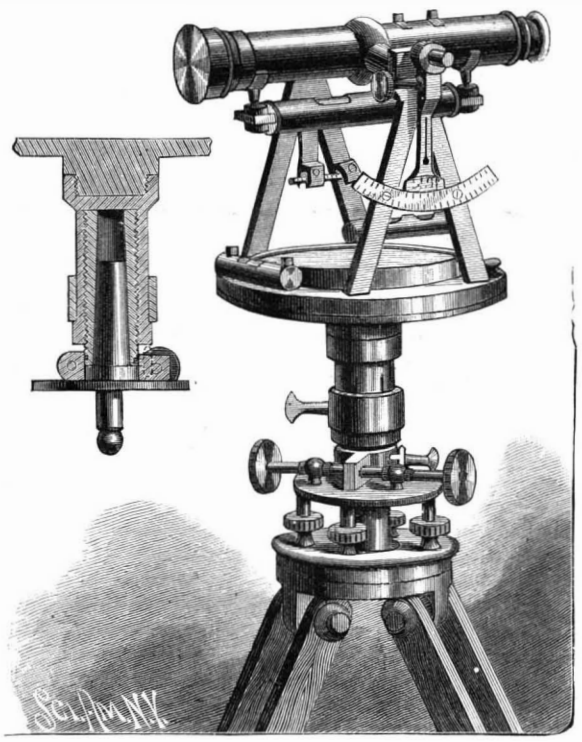


Fig. 1.—BOLT THREADING MACHINE.

AN IMPROVED SURVEYOR'S INSTRUMENT.

The accompanying illustration represents a readily applied improvement in the stands of theodolites and field transits, whereby the telescope can easily have its height adjusted after the instrument has been leveled. The invention forms the subject of a patent issued to Mr. John R. Hanlon, of Pennington, N. J. A boss depending from the limb or upper plate is recessed to receive the tapering upper end of the spindle, as shown in the sectional view. A cylindrical sleeve fits on the spindle below the boss, and turns thereon, a clamping collar surrounding the sleeve at its lower end, and a clamping screw engaging this collar by means of lugs or ears to bind the sleeve when necessary and prevent its turning on the spindle. A spring catch is also fastened securely to the clamp, and fits into a groove running completely around the inner sleeve, to prevent the possibility of the transit accidentally slipping from the spindle. The outer surface of the sleeve above the clamp is screw-threaded to engage the similarly threaded interior surface of an outer cylindrical sleeve, the upper end of which screws upon the boss depending from the upper plate. This outer sleeve has longitudinal slits extending upward from its lower end, surrounded by a clamping collar with clamping screw. When the bottom clamp is loosened the instrument can be turned laterally to any desired angle, and when the upper clamp is loosened the outer sleeve may be screwed up to any desired height on the inner sleeve. By this means the telescope has its height accurately adjusted after being leveled. It is not necessary that the spindle extend up into the boss, as the attachment can be made without altering the original spindle. the inventor having added the attachment to his



HANLON'S SURVEYOR'S INSTRUMENT.

own transit, and describing the working of the instrument therewith as very accurate and complete.

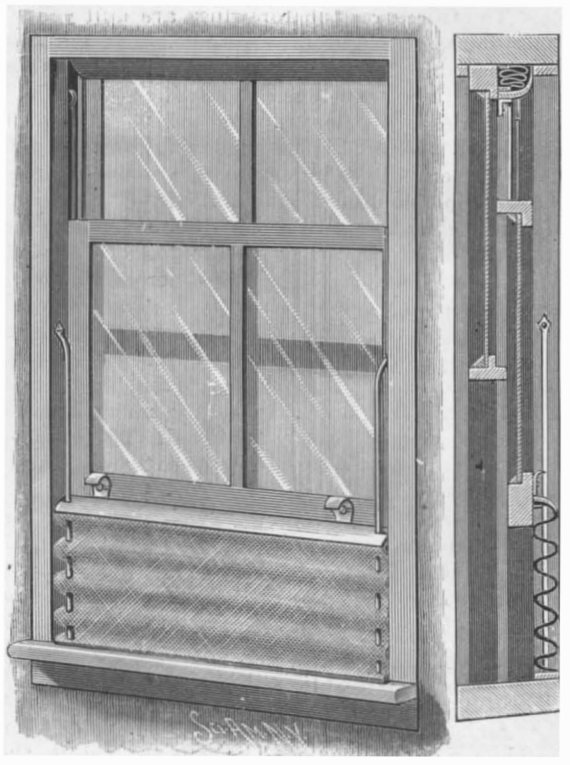
Paper in Japan.

In Japan, as is well known, it has long been customary to manufacture a multitude of articles, from overcoats and window panes to string and pocket handkerchiefs, out of paper, but the Japanese government, not content with these feats of national ingenuity, is just now bestowing great attention on the paper industries, and experimenting with pith, old silk rags, and many kinds of vegetable substances, with a view to other employments of paper in the arts. Mr. Liberty, in his recent paper read before the Society of Arts, London, describes a visit that he made to the government paper factory at Shiebu-Ogi, where he watched hundreds of intelligent little Japanese girls and women preparing the "mitsumata," or bark of the famous "paper mulberry tree," and arranging the snowy layers of pulp on the rectangular straining sieves. Toughness and a silk-like surface are the usual characteristics of Japanese paper, which, in spite of our recent progress in this department of the arts, still remains far superior to European paper.

THE Secretary of the Navy has ordered that the new war ship Baltimore shall be commissioned to convey the remains of the late John Ericsson to Sweden, his native country. The highest honors will be paid to the memory of the great engineer.

AN IMPROVED SCREEN ATTACHMENT FOR WINDOWS.

The accompanying illustration represents an improvement in that class of devices in which the screen proper is connected with the sliding sash, to be drawn out



HORTON'S SCREEN ATTACHMENT FOR WINDOWS.

and stretched when the sash is raised. It has been patented by Mr. William J. Horton. The lower edge of the screen is nailed or otherwise secured to the window sill on the inner side of the bead, the lateral edges of the screen being connected with and sliding on vertical rods on the inner sides of the jambs of the window frame. The upper edge of the screen is secured to the recessed under side of a wooden cross bar detachably connected with the lower portion of the sash by means of catches. The under side of the screen bar is recessed, and its front edge extended downward to adapt the bar to cover the screen when folded beneath it, whereby the screen will be concealed from view and protected from wear and injury, the bar also forming an unobtrusive and ornamental cap for the bead of the window sill. A similar screen attachment is provided for the upper sash, except that brackets are substituted for catches. The screens may be made of fabric or woven wire.

For further information relative to this invention, address Mr. John Menger, No 166 Hollis Street, Halifax, Nova Scotia, Canada.

Beetles in Furniture.

The long imprisonment of beetles within furniture is treated of in the last report issued by the New York State Museum of Natural History. It is suggested that when such cases occur, the conditions may bring about a lethargic state in which respiration and accompanying phenomena are almost or entirely suspended through the complete exclusion of air by the rubbing, oiling, and varnishing or other polishing the furniture has undergone. This instance of the imprisonment of a beetle *Science* cities from *The Illustrated American:* "In 1786 a son of Gen. Israel Putnam, residing at Williamstown, Mass., had a table made from one of his apple trees. Many years afterward the gnawing of an insect was heard in the leaves of this table, which noise continued for a year or two, when a large long-horned beetle made its exit therefrom. Subsequently the same noise was heard again, and a second insect, and afterward a third, all of the same kind, issued from this table leaf; the first one coming out twenty, and the last one twenty-eight, years after the tree was cut down."

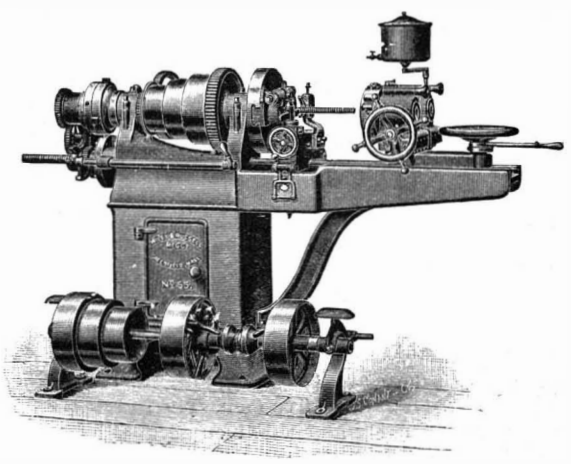


Fig. 2.—BOLT THREADING MACHINE WITH CUTTING OFF ATTACHMENT.

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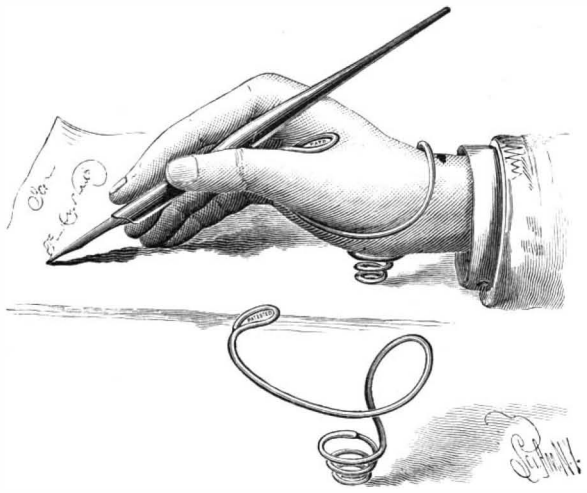
A HAND REST FOR PENMEN.

The illustration represents a device designed to constitute an elastic cushion or rest for the hand in writing, whereby the muscles of the arm will be relieved of the weight of the hand, and a general freedom of

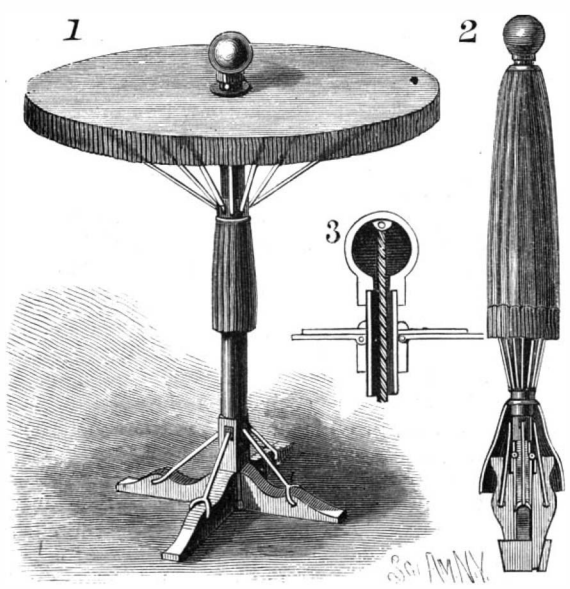


ELLIS' HAND REST FOR PENMEN.

action and elastic hold and pressure of the pen on the paper will be secured. It has been patented by Mr. George F. Ellis, of No. 898 Third Avenue, New York City. The device is preferably formed of spring wire, bent as shown, that part of the wire coming against the flesh being preferably covered with a flexible sheathing, such as a piece of rubber tube, and forming also a pad adapted to give only a soft or gentle pressure on the hand. The lower end of the coil or cushion is not covered with rubber, and is flattened down to reduce friction upon and facilitate its movement over the paper when writing. The whole device is readily removed from the hand when not required by simply springing the wire sufficiently for such purpose.

AN IMPROVED FOLDING TABLE.

The illustration represents a table designed to be folded up and opened in substantially similar manner to an umbrella, occupying but little room when closed, while capable of being so decorated that when opened for use it will constitute an ornamental piece of furniture. It has been patented by Mr. A. J. Delavigne, of No. 119 Barracks Street, New Orleans, La. The table has a central standard, hollow for most of its length, and having a slot in opposite sides. A slight distance below the top of the standard a series of straight ribs is hinged, radiating from the center, each rib having a stretcher rod hinged at one end to the rib and at the lower end to a traveler sliding upon the standard. Upon the upper end of the standard is a hollow ball or equivalent ornament, with attached sleeve, by which it can be readily placed on or removed from the standard, as shown in Fig. 3. The traveler in the central standard has a cross bar extending through the side slots, a rope extending from this cross bar to attachment within the ball at the top. Below the traveler the rope is divided into four strands, extending out through openings, in each of which a friction roller is journaled, and each strand being secured at its outer end to a leg. The inner side of the leg is straight and the legs are adapted to be folded up against each other, when their lower ends may be inserted in a ferrule, as shown in Fig. 2. When the table is to be set up, the ferrule is removed, and the central ball drawn up with its attached rope or cord, the latter drawing up the traveler and carrying the ribs to a horizontal position, the traveler then being held in such position

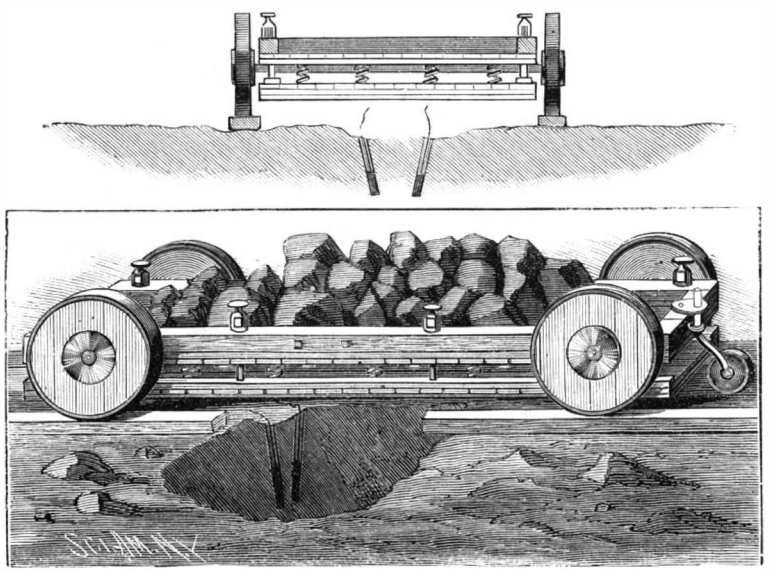


DELAVIGNE'S FOLDING TABLE.

by a bow spring, such as commonly employed to hold an umbrella open. As the ball is drawn upward to open the table, the lower strands of the rope are also drawn upon to cause each leg to assume a horizontal position at the base of the standard. After the table has been secured in the open position, the slack of the rope is passed into the standard and the ball replaced, as shown in Fig. 1. Any desired material may be employed, with perhaps a margin of fringe, and a curtain to be secured to the runner, in such way as to hide the operative parts without interfering with their action.

AN IMPROVED BLASTING CAR.

A car specially designed for firing a blasting charge in a quarry, street, or other place, without injury to persons or property from the flying material thrown up by the explosion, is represented in the accompanying illustration, and has been patented by Mr. Andrew R. Shannon. The platform of the car has a strong rectangular frame of wood, its corners re-enforced by metallic binding plates, and the sides of the frame bound together by suitable cross rods, and on this frame is formed a bottom of two layers of planks to support a load of stones, pig iron, earth or any other heavy material to hold the car in place. The wheels are preferably of wood, with iron bands to withstand concussion, and each has a steel tire adapted to run on wooden tracks, the axles being preferably of metal and square in cross section. Below the main bottom of the car is a false bottom, also formed of two layers of planks, the lower one covered on its under side with half inch boiler iron or steel. The false bottom is supported on vertical bolts, as shown in the sectional view, whereby such bottom may be raised and lowered as desired, and so the bottom can slide upward on them, and between the two bottoms are held springs, making the false bottom yielding in case of pressure from underneath. On the front beam of the car frame is a caster wheel, to facilitate moving the car from



SHANNON'S BLASTING CAR.

place to place, the car being designed to be moved into position over a trench in a street, or other exposed locality in solid rock where a blasting charge is to be fired. The car is also patented in Canada, and was used with best results in the construction of water works at Belleville, Kingston and Napanee, Ontario, many miles of trench being excavated in the streets and through the business parts of the above cities, and not a single light of glass was broken in the whole work on which the car was used.

For further particulars in relation to this invention, address Messrs. Moffett, Hodgkins & Clarke, Syracuse, N. Y.

The Names of American Scientists for the Titles of Practical Electrical Units.

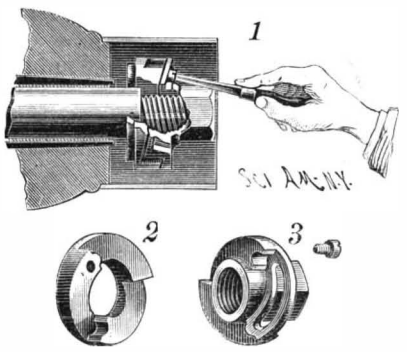
As our readers are aware, the custom of naming electrical units from the great investigators and students of the science, so far to the exclusion of Americans, has become firmly established. Almost the only break recently to be noticed is in the attempt to get a name, "mho," for the unit of conductivity by reversing the letters of the unit of resistance, the "ohm."

Accordingly, the American Institute of Electrical Engineers have taken the matter in hand, and in pursuance of a resolution offered at a meeting of June 17, 1890, by Mr. Francis B. Crocker, propose that American scientists should receive recognition. They propose that Benjamin Franklin and Joseph Henry, one or both, should be thus honored. As the latter was the discoverer of self-induction, his name should certainly be given to the practical unit of this function.

At present this unit indicates another departure from the "personal name" system, being termed a quadrant—certainly a very confusing title from its other applications. Henry's discovery of self-induction was published as long ago as 1832 in Silliman's *Journal*. For the honored name of Franklin no place is as yet proposed. The disagreeable "mho" might well be relegated to obscurity and "Franklin" put in its place.

AN IMPROVED ADJUSTABLE AXLE NUT.

A nut designed to be conveniently adjusted for taking up the end wear of vehicle hub boxes and



THORP'S ADJUSTABLE AXLE NUT.

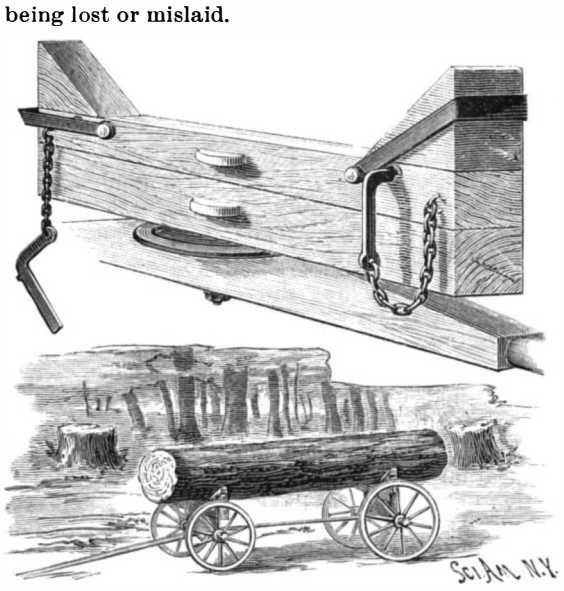
washers is represented herewith, Fig. 1 showing the operation of adjusting the nut. The set screw is loosened and moved down the slot, thereby turning the inner part so that the thicker portions of the cams come opposite, thus extending the nut inwardly until in contact with the box, the outer part remaining stationary against the shoulder of the axle. Figs. 2 and 3 are perspectives of the two parts detached, showing the form of the engaging surfaces, the set screw, and the slot in which it is moved. This device obviates the necessity of fitting the washers, as they may be used of any thickness, and worn completely out before renewing, always insuring a firm and smoothly running wheel. Persons desiring to inquire further into the merits of this invention may address the patentee, J. M. Thorp, of Santa Rosa, Cal. A full-sized model will be furnished to those desiring such on receipt of $1.

Patents that Pay.

"You have seen those toy woolly dogs which jump about on Fourteenth Street," said Thomas Harncroft, a patent lawyer, recently, "which are made to dance by pressing a little rubber ball. Well, the man who invented those made over $6,000 out of his patent. The old-fashioned 'returning ball' coined a fortune for its inventor. Even the man who patented the hooks on lace shoes gets over $300,000 a year in royalties for them. There is a fortune in small patents if you hit the popular taste."—*N. Y. World*, *July* 17.

AN IMPROVED BLOCK AND CLEVIS FOR LOG WAGONS.

The illustration represents a device for holding logs in place on a wagon, sled, or other vehicle, and consists in a triangular block adapted to rest upon the bolster, a clevis pivoted to the bolster in such a manner that it may be swung upwardly upon the block, with a peculiarly formed key for holding the clevis in position. This invention has been patented by Mr. William H. Miller, Sen., of Wyandotte, Ark. The clevis to hold the triangular blocks in position is pivoted to the bolster by a pin which passes through the bolster and both arms of the clevis, the latter swinging vertically on the pin. The clevis is held in its uppermost postion, to hold the blocks in place to support a log, by means of an angular shaped key preferably made of flat iron. The key fits in a hole near the upper edge of the bolster, and has on its upper edge a lug, to be moved in a recess in the edge of the hole, whereby the key is held in place. The key is preferably attached to the bolster by a chain, to prevent its being lost or mislaid.



MILLER'S BLOCK AND CLEVIS FOR LOG WAGONS.

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Correspondence.

Remedy for Ants.

To the Editor of the Scientific American:

In reply to Mr. C. T.'s request about "Ants," July 5, 1890, SCIENTIFIC AMERICAN, desire to state: Buy one-half pound or more corrosive sublimate, powder it very fine, and strew the same sparingly on the ground about the India rubber tree, also in the crevices, nests, and trails of the ants, and I guarantee the ants will leave your lawn and premises as quick as they have come. Corrosive sublimate is a deadly poison, and should be handled with care. F. H. C. MEY.

Buffalo, N. Y., July 6, 1890.

Estimating the Cost of Building.

A correspondent (H. C. R.) in *The American Builder* gives the following short way to estimate the cost of a plain house.

I first commence with the excavation.

Each cubic yard of dirt to be left on lot as thrown out, 20 cents. All sand and clay to be used by contractor free that is found in cellar and trenches.

Stone to be of freestone rock work, face 25 cubic feet to the perch, at $3.50 a perch.

Cellar, 12 by 24, to cost:

Grates, $1 each.

Outside cellar stairs, complete with doors, $6.

Now, the lower floor, joist, bridging, flooring and time, each square, $12.

Second floor, the same a square, $12.

Upper tier of joist, lumber and time, per square, $2.

Roofing, per square, rafters, lath, sea green slate and time, $7.50. Coping, per foot, 10 cents. Chimney backs, each back, 75 cents. Flashing, per foot, 8 cents.

Cornice.—Plain cornice, per lineal foot, flooring, fillet and time, 15 cents.

Siding.—All sides where siding is to be used, siding, studding and time, per square (10 by 10 feet makes a square), $3.60.

Partitions.—Studding and time, each square, $1.75.

Box stairs.—Each flight (no rail), lumber and time, $12. With rail and baluster at landing, $19.

Doors.—Door frames, doors No. 1, locks and butts, casing and time, each door, $6.50. No. 2, $5.50. Front doors and transom, $10.

Windows.—Each window, sash and glass, $6.50; frame, casing, time and locks, $5.

Base.—Each room, lumber and time, per room, $3.50.

Pantry.—Shelves, common way, lumber and time, from 6 to 8 shelves, $4.

Wainscoting.—Per lineal foot, time and lumber, 20 and 25 cents.

Spouting.—Per foot, put up, 10 and 11 cents.

Veranda.—Per foot, face measure, turned posts, brackets, tin roof and spindle work, $3.50 and $4.

Chimneys.—Per foot, 75 cents, 90 cents and $1.

Mantels.—Each mantel, slate and hearths set in place, $18 and $20.

Painting.—Per square, $1.25, $1.50 and $1.75.

Sundries.—Such as door bumps, sash lifts, hooks, strips, etc.

Any new beginner that makes his estimates according to this rule will save at least one-third the figuring and is just as correct as the long way. I know this to be the fact, as I use this same rule in all of my estimating. If this is of any benefit to my brother chip, he is welcome to it.

Unfreezable Dynamite.

This invention is due to Herr Edward Liebert, Berlin, and it consists in adding a small percentage of a chemical ingredient either to the nitroglycerine or to the dynamite itself. Having, says *Iron*, so recently pointed out the dangers attendant upon the operation of thawing dynamite, because that operation is so seldom carried out in a proper manner, we need not now dwell upon the subject. We will only observe that the reports of H. M. inspectors of explosives show that the most fruitful source of accidents with dynamite is the thawing of the cartridges, which freeze at the comparatively high temperature of about 40° Fahr. The ingredient added by Liebert does not commence to freeze at 35° below zero, and it in no way detracts from the strength of the dynamite to which it is added. On the contrary, it slightly increases its effective power, being in itself explosive. The unfreezable dynamite is also said to be somewhat less sensitive to concussion than ordinary dynamite. Sir Henry Roscoe, F.R.S., has subjected unfreezable dynamite to exceedingly low temperatures, and he reports that Liebert's invention "is of great value and importance, as rendering solidification practically impossible, and therefore greatly diminishing the liability to chance explosion, by avoiding the well-known danger incurred in melting the frozen nitroglycerine." We are glad to notice the advent of such an invention, the public importance of which cannot be overrated.

Two Great Railway Enterprises.

The construction of a railway across the Sahara Desert to unite Algeria with the Soudan, and the laying down of a line across Siberia to connect the European systems with the extreme Orient, are two works of stupendous magnitude that are being undertaken respectively by France and Russia. Both proposals have been long under consideration, but it is only lately that they have received the necessary sanction of the governments. The idea of the French in constructing a line across the Sahara is to put their three possessions—Algeria, Senegal, and the Gaboon-Congo—into direct communication with each other, and at the same time to open up to commerce the vast area of territory which French exploration proves to be well worthy of the enterprise. Instead of being a desert, as was represented by popular ideas, the Sahara is highly productive in parts on account of its being well watered by rivers and lakes. The climate is mild and equable, and eminently suited to agriculture. The first difficulty in connection with this Trans-Saharan railway was the selection of the point from which to start. Both Senegal and the Gaboon-Congo are peculiarly suitable on account of their proximity to the territory which has to be traversed, but Algeria was selected on account of its value as a base of penetration. The work will be very costly, the estimated expense of laying the line in the midst of the desert being about £3,500 a mile. When completed the line will tap the Soudan and the region watered by the Niger, and will immediately connect it with the Mediterranean. The work has already been begun under authority of the government. The railway across Siberia owes its initiative to the activity of General Armenhoff. Its completion will necessitate the laying down of 4,200 miles of rails, and it will stretch from the west of the river Oural to the Russian port of Vladivostock, on the Sea of Japan. The line will naturally take a southern route, so as to avoid the forests and the animosity of the natives, and it will take in the rich mineral district lying between Lake Baikal and the river Amoor, where petroleum is especially found in great abundance. The line has already penetrated a little way into Siberia, and has now reached the town of Tjumen. The work will take many years to complete it, but it is stated that the railway will become valuable as a means of stimulating commerce with China before it reaches its eastern limit.

The Kitchen Sink.

The *Mechanical News* discourses as follows on a fixture of much importance in domestic economy, cleanliness, and health:

First as to the material—we all know by heart the undeniable statement which appears on so many prominent signs, that "Cast Iron Sinks." The same remark might be made of lead, earthenware, and even of wood, in the same connection.

Each material has its peculiar merits and demerits.

Items for cast iron: It is cheap and non-porous. Against it: It gets rusty and unsightly, unless zinc-coated by that process so inappropriately termed "galvanizing."

A lead sink of course means a lead-coated sink—generally of wood. It does not get rusty; but it does get wrinkled like unto the visage of Methuselah during, say, the last 900 years of his life. Fewer dishes, etc., are broken in a lead-lined sink than in one of iron, for obvious reasons.

A non-lined wooden sink is an abomination. It gets foul in spite of soap, sand, and scalding, and is not durable.

Nearly every sink in every fifty houses you may name is too small to take in a self-respecting dish pan. It might be laid down as a broad general principle that sheep and beeves grow about of certain sizes; that roasts of mutton and beef come of about certain sizes; that dishes have to be big enough to hold them: and that sinks should be big enough to take in the dish pans which are to hold those dishes.

Next memorandum: The average servant girl will choke up any sink outlet on the market. We must circumvent her by either making a non-chokable outlet, or providing easy means of removing the obstacles, once in them.

Some day some bright dealer will put on the market a sink trap which can be removed by the average kitchen servant, or at any rate by her bond servant—the alleged master of the house—and which can, when so removed, be opened out lengthwise, and flushed free from grease coatings and from anything which may have lodged in the way of an obstruction.

The entire strainer device needs to be reorganized on a dividend-paying basis. There should be quite a deep and long recess between the bottom of the sink and the trap; and the upper strainer should be flush with the bottom of the tank; flat and level; readily removable, and strong enough not to be in danger of breakage. The under strainer should have very fine holes; should thoroughly protect the trap from the entrance of solid matter; and should be screwed in so as not to be removed without some little trouble.

I am not sure but that the sink should have faucets like those of stationary washstands, to swing back out of the way. One thing is certain: If there is a pump at the sink, it should be so arranged that its barrel should not take up half the sink and its handle about one-quarter of the kitchen. The pump should be set at the end of the sink next the wall, or most out of the way; this preferably at the right hand side, because most people are only right-handed instead of both-handed; and the handle should swivel out of the way. The contrary extreme is sometimes gone to; the handle is so close to the wall that the operator barks his or her knuckles three times out of a possible four.

If the sink pump is also arranged with a by-pass so that it supplies or forces the water to the tank in the attic, then it should surely be so arranged that the soloist can change hands while executing an adagio.

There are two things which can be done with the space under the sink.

One is to fill it in, and thereby offer a premium on the closet thus formed, with a choice selection of wet house cloths, cinquecento scrubbing brushes, saucers of stove polish, back number gaiters, etc.

The other is to leave the space clean and open, without even a projecting leg to support the sink.

I think, the writer adds, that good housewives will vote for the open space.

I am not certain but that the sink should stand out from the wall half an inch, for anti-croton-buggian reasons.

Its anterior angles should be rounded to a gentle radius to prevent the lodgment of greases and to facilitate cleaning.

Electric Power Rates.

In our last issue, says *Electrical Engineer*, we gave a few illustrations of the manner in which the electric power business had now come prominently to the front as a means of providing daytime work for central stations. It is to be borne in mind that the motor business depends largely for its success upon the rates at which the consumer can secure his current. We have received within the last few days the new schedule of power rates recently adopted by the Brush Company, of Baltimore, "after a very careful consideration." It is as follows:

⅒	horse	power	$2 50
¼	"	"	3 00
½	"	"	5 00
1	"	"	10 00
2	"	"	16 00
3	"	"	21 00
4	"	"	26 00
5	"	"	30 00
6	"	"	33 00
8	"	"	42 00
10	"	"	50 00

This scale, which went into effect on July 1, seems reasonable for a city presenting such conditions as Baltimore does, with a large population engaged in a variety of pursuits but not distinctively of the industrial type and not presenting so great a diversification of small industries as one finds, for example, in Boston or Newark. Still the motor business has been fairly well worked up in Baltimore, and there are now 375 motors representing about 200 horse power of daily consumption of current. With the revised schedule this number and quantity should increase quickly.

Legal Aspects of Photographing Buildings.

An excellent idea is suggested by an architect who writes to the Pittsburg *Real Estate Record* as to the benefit of photography in building operations. He remarks:

"With high buildings arises a question of good foundations, especially when they are built alongside of old buildings two or three stories high. The greater weight of the new and high building is apt to crack the old building and damage it, and great care should be used in building up to prevent the settling of the new building from injuring the adjoining property. I suppose that for any damage done to the adjoining building the proprietors of the new building will be responsible, so I would recommend not only care in the foundation of the new building, but that the adjoining buildings be photographed to a large scale before any work is done on the new building, so that their condition might be on record in the event of a claim for damages. These photographs should be taken under the charge of one well acquainted with building, and should be not only the back and front, but the sides and parts of the buildings adjoining the new one. Often there are cracks in these side walls, and they ought to be photographed. One may laugh at the idea of photographing a crack, but it is sometimes very necessary, and I have seen the owner, who was claiming that the new building had damaged his property, look very queer when a photo of that same crack was shown, proving that it was there before the new building was erected."

QUILL toothpicks come from France. The largest factory in the world is near Paris, where there is an annual product of 20,000,000 quills. The factory was started to make quill pens, but when these went out of general use, it was converted into a toothpick mill.

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Metallurgical Use of Fluorspar.*

BY DR. FOEHR.

Flourspar was, until the commencement of this century, considered an indispensable flux; it diminishes the loss of metal and was then the only energetic means to reduce the melting point of slag from ores carrying a high percentage of clay and zinc. Without fluorspar very refractory ores could not be smelted at all.

Gradually, however, as the blast furnaces and smelting apparatus were improved, fluorspar was superseded by lime and other cheap fluxes, but of late its use has been reintroduced into nearly all branches of metallurgy.

While fluorspar is regarded as a mere means to unite with excessive silicic acid, the possibility of its adoption is surprising, in view of the fact that the cost of fluorspar is six to seven times greater than that of limestone, while the formulas for fluorspar and limestone respectively,

$$2CaF_2 + 3SiO_2 = 2CaSiO_3 + SiF_4 \text{ and}$$
$$3CaCO_3 + 3SiO_2 = 3CaSiO_3 + 3CO_2,$$

show that the quantitative economy in fluxing with fluorspar compared with limestone is as 156 to 300. The fact is, however, that one part of fluorspar goes further than ten parts of limestone. The former is specially effective in reducing the quantity of fuel; it forms two parts of slag where limestone forms three, and it forms possibly also fluorsilicate, whereby heat is likely to be liberated.

While the rather high price of fluorspar prevents its use in the production of ordinary white and gray pig iron, it has proved a rapid and energetic solvent in blast-furnace work, where it is blown in as powder through the nozzles.

In making silicon iron, fluorspar plays a more important part. A ferrosilicon iron, with 10 per cent silicon, made specially in Upper Silesia, is almost indispensable for works that make very tough, deep-gray castings. This ferrosilicon can be obtained in any ordinary blast furnace from any silicious iron ore, if it is only fluxed with fluorspar and the slag is strongly basic. The fluorspar reduces the silicon energetically; at all events fluorsilicon is formed, which is reduced to silicon by the hydrogen contained in the furnace gases, and possibly also directly by the coke. It does not seem impossible that the greatly increased price for coke will result in a reintroduction of fluorspar as a fuel-saving flux in the manufacture of foundry pig, particularly as even a very small quantity of fluorspar, added to the charge, at once raises the product to No. 1 deep gray pig, rich in graphite.

The remarkable property of fluorspar, that it facilitates the reduction of the most different bodies—a property common to almost all the fluorides—makes it a valuable flux in the production of spiegeleisen. It has long been known that fluoride of manganese, as well as a mixture of a manganese combination with fluorspar, can comparatively easily be reduced to metallic manganese by means of sodium. This reaction served Brunner in his successful attempts, the first ever made, to produce metallic manganese in large quantities. The modern application of this method to the blast furnace substitutes carbon for sodium. A highly basic slag, rich in flourides, seems nearly indispensable for the production of a rich ferromanganese in the blast furnace.

The property of fluorspar, to carry phosphorus into the basic slag, has never been of special importance as far as pig iron is concerned, but it is utilized by the Krupp & Rollet methods of dephosphorizing pig in the basic-lined cupola-furnace. While, at all events in the blast furnace process, the property of fluorcalcium to form an easily melting slag with phosphates is of some importance, fluorspar in the process of purifying the pig iron serves probably only as a flux for the highly basic limeslag saturated with phosphorus.

In the Thomas process too, and even in the Bessemer converter, fluorspar is in recent practice being added in small quantities for the purpose of concentrating the slag and reducing the loss of metal; very great care, however, is needed to prevent such a slag from attacking the acid lining. It is also said that in puddling in the various steel-making methods and in the Siemens-Martin process, fluorspar is added partly as a slag-forming flux. The details are, however, not known.

In foundry work, it is an astonishing fact that limestone, which, because of its cheapness, superseded fluorspar, of late is losing ground to the latter. The limestone flux in cupola-furnace work serves only to slag the ashes of the fuel, the sand adhering to the pig, etc., no chemical effect on the iron being intended. But fluorspar affects the iron noticeably, keeps it gray and soft by keeping the silicon as an alloy, while a limestone flux favors the tendency of the silicon to slag. Besides, fluorspar carries some phosphorus and sulphur into the slag. Fluorspar makes it possible to melt inferior kind of pig iron and a higher percentage of scrap. But, strange enough, practice has shown that too much fluorspar is rather injurious than advantageous; one reason for this being that the manganese contained in the iron is thereby prevented from slagging.

The quantity of fluorspar which is added to 100 kilogrammes of pig iron to be remelted is one-third or, at the most, one-half kilogramme. The improvement of the product caused by this flux is specially manifest in the improved cupola furnaces, particularly the Herbert's furnace, which has much facilitated the utilization of inferior iron for soft castings. The property of fluorspar to protect manganese does not seem favorable enough to offset the injury due to its silicon-reducing power. Its use would, at least, require melting in a basic furnace or as cold as possible.

As the small quantity of the phosphorus and sulphur which is contained in Swedish charcoal iron is almost entirely carried off in the comparatively acid slag by fluorspar, this is of prominent importance for the treatment of very pure qualities of iron.

* *Chemiker Zeitung.*

Patents on Fruits and Plants.

The subject of securing to the originators and owners of new varieties of fruits and vegetables the sole right by law to propagate and sell them engaged the attention of the recent meeting of American nurserymen in New York, and the matter was referred to a special committee for further consideration. Since that time, a circular has been distributed by our valued contemporary the Rural Publishing Company, with a proposed law, submitted for the consideration of horticulturists, under the head of "To Protect Plantsmen." The circular suggests the appropriation of $50,000 by the general government, to establish testing stations at the State experiment stations, and a board of experts at Washington, to decide the claims of applicants. A register of cultivated plants is to be made, and their identity or distinctive character is to be determined by actual cultivation.

This is certainly a praiseworthy attempt to secure to originators of varieties compensation for their labor, but it strikes us as involved in difficulties which will render it impracticable by way of accomplishing the desired end. Patents for machinery may be accurately described, and each kept entirely distinct from all others; but the differences between varieties of plants are so indefinite that a description in words would fail to point them out. The peculiar flavor, for instance, in hundreds of fruits, could not be so accurately given that a pomologist could not make a mistake in recognizing them. Take the apple, for example, of which there are already some three thousand described varieties of this single species; it would be impossible for the most experienced pomologist to say that a new claimant was not one of these old sorts, under the changing influence of different soils, varying climate, changing seasons, unlike culture, and many other influences; yet the decision of important legal questions involving large sums of money would depend on these changing shades of quality. We have known some of our greatest pomologists, as Wilder, Downing, and others, to require years to decide questions between them, accompanied by continued cultivation and bearing; and the continued annual reports bear witness of the difference of opinions on fruits. What could the board of experts do in order to decide between the thousands of varieties of apples, the many hundreds of pears and of peaches, of plums and cherries, of grapes and strawberries? Could they point out distinctive and peculiar characteristics in every one of these many thousands, or would they have to keep them all in bearing the year through, in order to compare the old and the new varieties? If so, there would still be another and greater difficulty—the changes in size, quality, flavor, growth and appearance, produced by cultivation, soil, climate and season, often entirely altering the fruits. We have known fruits taken from different parts of the same tree to be pronounced quite distinct.

All these influences would be liable to place an honest cultivator in great peril or to give an adventurer an advantage over him. The community has been greatly annoyed in past years by overbearing claimants under the head of mechanical inventions; but a law of the kind proposed, with such a multitude of indefinite objects, would be liable to greater difficulties. We have heard an experienced cultivator assert that he would not dare, under such a law, to cultivate any common fruit, as its character could be changed and unscrupulous persons claim a new one from a cultivated old variety, or prove that a new and pilfered sort was some old one.

Mr. Meehan stated some years ago that Mr. Durand (so widely known for the production of new strawberries) had at one time 3,000 new sorts, every one of which he asserted possessed merit. How could a board of experts distinguish every one of these, and decide a controversy between claimants and the thousands of new strawberries which have been produced?

An establishment at Washington for testing varieties would give a very different result with many sorts at that place, as compared with results in the North, or West, or in the Southern States; and opinions at one agricultural experiment station might vary greatly from those given at others.

This subject has occasionally come up before our horticultural meetings in past years, and we have always entertained but one view of the difficulties attending any legal enactment. The only practicable remedy for the losses likely to be sustained by originators of new fruits and vegetables appears to be in the use of names as trade marks, which are distinct and cannot be varied. Some of the members at the nurserymen's meeting already alluded to stated that they had used trade marks under existing laws, protecting them to a great extent.—*Country Gentleman.*

New Method of Preparing Lantern Slides.

Dr. Sorby, F.R.S., recently gave a demonstration of his new method of preparing specimens for exhibition by the lantern. On the whole, his method consists in drying specimens on glass, and in some cases in subsequently mounting them in Canada balsam. As an illustration, some cases may be described. Taking such a beautiful Nudibranch as Eolis, it may be first washed in a mixture of equal parts of alcohol and water, then properly arranged on the glass, and allowed to dry. Success depends to a great extent on the fact that the edges dry first, and adhere to the glass in such a manner that the subsequent drying reduces only the thickness of the object; and when dry the original outline is perfect, and the animal seems as if it were a projection on the plane of the glass. When subsequently mounted in balsam and used as a lantern slide, the natural form and color are seen on the screen like a beautiful picture. Such Chætopoda as Niveis are easily prepared, and when thrown on the screen, not only the general form but every hair and the chief blood vessels are visible, though some of the latter are too small to be well seen unless the real object is examined with a low magnifying power as a hand specimen.

Strange to say, such very unpromising animals as Medusa give most satisfactory results. They must first be deposited for a considerable time in diluted alcohol, to remove the salt, then stained with Keinberg's hæmatoxolin or Beale's carmine, and finally dried on glass and mounted in balsam. When thrown on the screen the most important points in their structure are well seen. The fringe of tentacles and the sub-umbrella stain dark, while the canal system is beautifully shown dark on a pale background. It would be difficult to artificially paint a diagram showing the structure better than does the real animal thus prepared. Such preparations as those named above are equally satisfactory as museum or cabinet specimens, as they take up less room than bottles, do not lose their color, and can be easily examined in the hand with low magnifying power.

Venice and Stolen Property.

Venice, in fact, is one vast museum of stolen property. A self-righteous inscription over the gateway of St. Mark's informs the visitor, with much show of conscious probity, that the four famous antique bronze horses above the portal, "removed by the rapacity of the enemy to Paris" under Napoleon I., were again restored to their proper place by that incorruptible champion of strict international morality, the Emperor Francis. But the glorious team, a work of the sculptors of the Neronian age, had previously been stolen in the thirteenth century by the Doge Dandolo from Constantinople, whither they had been carried from Rome, for his own glorification, by Constantine the Great, who had filched them himself from the triumphal arch of Trajan, who in turn had borrowed them, as seems probable, from the similar monument of his predecessor Nero. Such are the humors of the world and the whirligigs of time. Indeed, if every man had his own again, one might almost say there would be no Venice. The column of St. Mark's with its winged lion would go back to Syria; the square pillars by the Doge's palace would return once more to St. Saba, at Ptolemais; the alabaster supports of the inner canopy would find their way back, men say, to Solomon's Temple; and even the mouldering body of the Evangelist itself, which reposes beneath its pall of gold and jewels below the high altar, would have to migrate to the community from which it was first filched, the Coptic Christians of Alexandria.—*The Cornhill Magazine.*

The inventions of Mrs. A. La Guayra Mayo, illustrated and described in our last paper—a sewing machine guide and a hemmer attachment for sewing machines—form also the subjects of patents taken through the SCIENTIFIC AMERICAN patent agency by this lady inventor in Great Britain, France, Belgium, Germany, Austria, Italy, and Canada. It will thus be seen that the field for a profitable invention is by no means limited to that covered by a United States patent, there being, indeed, often equal promise of a return in other countries, where the number of patents taken out is far less than in the United States.

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Charging for Knowing How.

American Furniture Gazette: "I paid a bill the other day," said a large manufacturer to me, "without a murmur, simply because of the way it was worded. My engineer found that his hot water pipe would not work, and after puttering at it for an hour sent for a machinist. He bothered with it half a day and concluded it must come apart. I was much annoyed, for that meant the stoppage of my factory for a long time. Before I gave the order to take it to pieces some one suggested that a neighboring engineer be sent for, as he was a sort of genius in the matter of machinery. He came, and after studying the pump awhile he took a hammer and gave three sharp raps over the valve. 'I reckon she'll go now,' he quietly said, and putting on steam 'she' did go. The next day I received a bill from him for $25.50. The price amazed me, but when I had examined the items I drew a check at once. The bill read this way: 'Messrs. Blank & Co., Dr. to John Smith. For fixing pump, 50 cents. For knowing how, $25.' Had he charged me $25.50 for fixing the pump, I should have considered it exorbitant. But 50 cents was reasonable, and I recognized the value of knowledge, so I paid and said nothing."

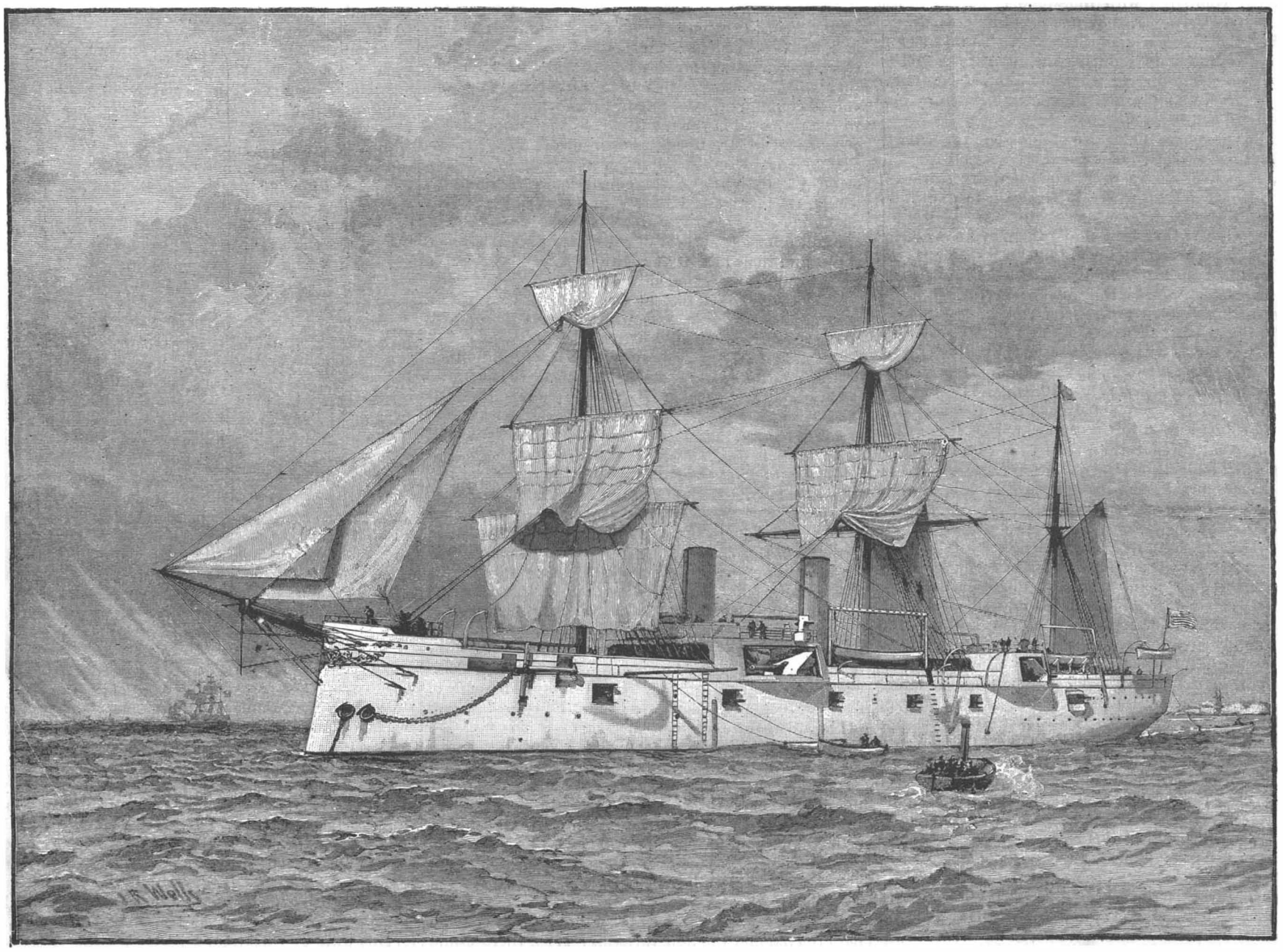
[That man evidently knew as much about making bills, the *Railway Review* adds, as he did about fixing pumps.]

The Kidney Bacilli.

There is a disease in Japan known as *kakke*, a disorder of the kidneys communicated by bacilli, and closely related to the more virulent *beri-beri*. From the distribution of *kakke*, M. Gueit, says *Nature*, has recently drawn conclusions as to the ethnic composition of the present population of Japan. The fact that Chinese always escape the disease, even in localities where it is very prevalent, indicates (in his opinion) that the Chinese or Mongolian element is not the dominant one. He finds three constituents in the population: (1) descendants of Ainos; (2) of Negritos; and (3) a Malayan element, which is the most prominent. Wherever the Malayan goes, he brings with him the *beri-beri* order of disease; his liability to this being probably due to the Hindoo blood in him. From India we find *beri-beri* spread, like the Malays, to Madagascar on the one side and to Japan on the other; we meet with it also in Java, Sumatra, etc. According to the proportion of Malay blood in the natives of Japan is the frequency of the malady, which occurs in various forms and under different names. As to the Negrito element in Japan, M. Gueit found an interesting proof of it in the island of Sikok, in the form of a small statuette of Buddha having the characteristic nose and hair of the Negritos.

THE CHICAGO.

The squadron of evolution sent by the United States government to the Mediterranean, under command of Rear-Admiral John G. Walker, attracted much attention. The admiral's flagship was the frigate-built steel cruiser Chicago, which is represented in our illustration, for which we are indebted to *The Illustrated London News*. This ship, constructed of mild steel, at a cost of about one million dollars, and launched in 1885, is 334 ft. long, 48 ft. broad, and draws 19 ft., having a displacement of 4,500 tons. She has two screw propellers, with engines of 5,500 horse power, indicated; the machinery is protected by a partial steel deck. Her speed is 15 knots an hour, and she carries 940 tons of coal. The armament consists of four 8 in. breech-loading guns, on the spar deck; eight 6 in. breech-loading guns, in broadside, on the gun deck; and two 5 in. breech-loading guns aft; with six machine guns.



THE STEEL CRUISER CHICAGO, AS SHE APPEARED IN THE MEDITERRANEAN.

Medical Uses of Anilin.

It is a well-known fact in biology that bacteria and bacilli absorb anilin and are killed by it. Two German observers—Stilling and Wortmann—have recently considered the possibility of utilizing this property in medical treatment (Humboldt). The diffusibility and harmlessness of violet anilin dyes (called, for brevity, "methyl violet") without arsenic, in small doses, were first demonstrated on rabbits and guinea pigs. Then certain eye disorders were produced in those animals, and treated with anilin solution, the results being excellent. The authors proceeded to operate on the human subject. A skin ulcer on a scrofulous child, which had been treated for a month with the ordinary antiseptic agents without success, was gradually healed by daily dropping a little anilin solution on the sore; and similar good results were had with bad cases of eye disease. It soon appeared that many surgical cases were open to successful treatment in this way; and that, in general, wounds and sores developing suppuration could be sterilized with anilin. It is also thought that cases of internal inflammation, as in pleuritis and peritonitis, may prove to be not beyond the reach of this order of treatment.

The Areca Nut.

A recently published paper on "The Narcotics and Spices of the East," which was read by Dr. Dymock bebefore the Anthropological Society, of Bombay, contains, according to the Calcutta *Englishman*, some interesting information about the areca nut, which is called *supari* by natives, and usually betel nut by Europeans.

Although the nut is so well known, it has only been scientifically investigated in comparatively recent years. The palm on which it grows is supposed to be indigenous in the Malayan peninsula and islands, but is now only known in the cultivated state. Few persons have any idea of the consumption of the nut in India; but, as a matter of fact, in addition to the vast quantity locally produced (Dr. Dymock says 100,000,000 people eat it every day of the year), there is an annual import of about 30,400,000 lb. from Ceylon, the Straits Settlements, and Sumatra. On the other hand, there is a small annual export of less than 500,000 lb. for the use of Indians living in Zanzibar, Mauritius, Aden, China, and other countries. It is well known to the natives that the fresh nuts have intoxicating properties and produce giddiness, and that the nuts from certain trees possess these properties to an unusual extent, and even retain them when dry. These intoxicating properties are much diminished by heat, and as the nuts which possess them are apt to be mixed up with the common sort, many cautious people decline to use any except the red nuts of commerce, which have all undergone a process of cooking. Dr. Dymock inclines to the opinion that the original wild nut must have been an intoxicant, especially as the unripe nuts of the best trees produce slightly intoxicating effects. The betel leaf or *pan*, with which natives eat the areca nut, is highly esteemed, and its thirteen properties are enumerated in the ancient books of the Hindoos. Until very recently the nut was supposed by European medical writers to be simply astringent, and the intoxicating properties of the *bira* or *pan*, the universal native pledge of friendship, were supposed to be due to the leaf, and to the spices which with lime are put into the *pan*. But the process of organic chemistry has led to the discovery of organic properties in the nut, the active principle of which, if injected under the skin of rabbits and cats, causes their death in a few minutes. At the same time the essential oils of betel leaves have been found to be highly beneficial in catarrhal affections and throat inflammations.

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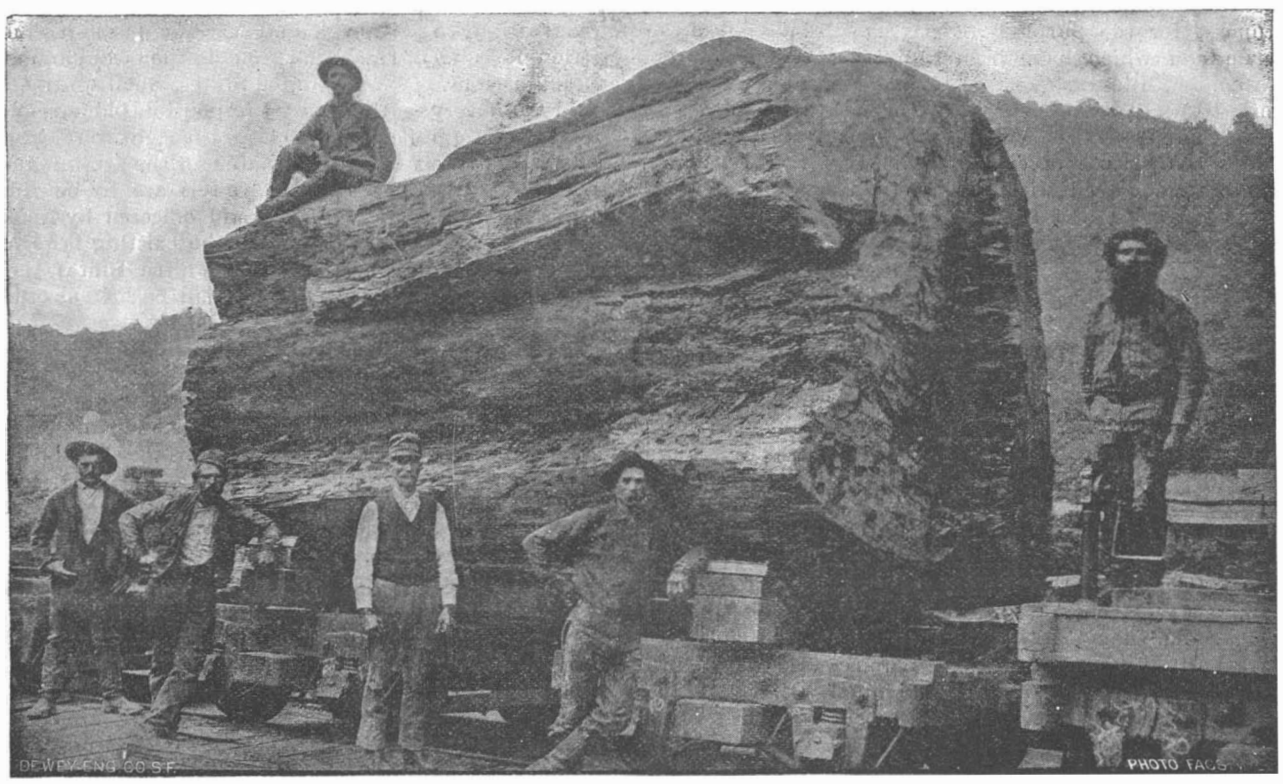
REDWOOD LOGGING IN CALIFORNIA.

The illustrations herewith, both made from photographs, give a vivid idea of the size of the lumber afforded by California trees, and go a long way to afford an explanation of the wonderful growth of the lumber industry on the Pacific slope within a few years past. The picture of the hauling of a redwood log to the mill, for which we are indebted to the *Mining and Scientific Press*, of San Francisco, represents a scene in Humboldt County, while the immense train load of logs shown in the larger view was photographed for the SCIENTIFIC AMERICAN while on its way to the Excelsior Redwood Co., at Eureka, Cal. These trees are not what are known as the great trees of California, the *Sequoia gigantea*, which have been found only in small groves on the Sierra Nevada, at a height of about 4,500 feet above the sea level. But the redwood bears a strong resemblance to the mammoth tree, and is sometimes mistaken for it, as it frequently grows to a height of 300 feet and a diameter of 16 feet.



HAULING A REDWOOD LOG TO THE MILL.

In felling these trees, saws are now largely used instead of axes—the ordinary cross-cut saw, usually from 10 to 12 feet in length, with the ax, wedges, and a sledge hammer. Logging railways are largely used in transporting the logs to the mill, and in many cases to carry the lumber from the mill to tidewater or the place of shipment. When the railroad runs into the tract of timber being cut, donkey engines are used to load the logs on the trucks and for other heavy work usually done by horses or oxen.

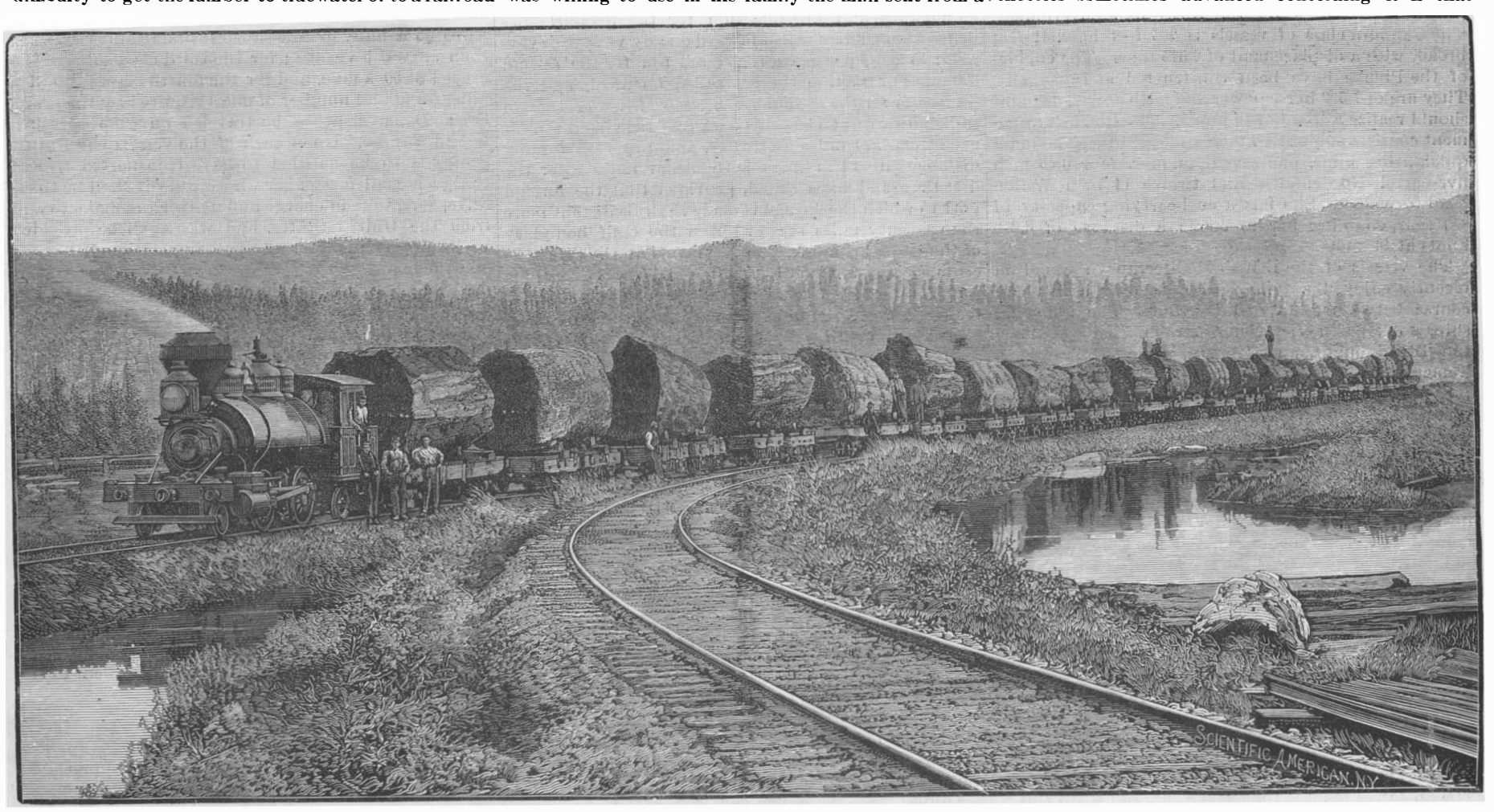
The redwood forests are generally in hilly country, so that in many cases it has been a matter of no great difficulty to get the lumber to tidewater or to a railroad leading to market. The timber is light and close-grained, much resembling in appearance red cedar, but darker. It is eminently durable and not attacked by insects, and the large growth of the trade in it attests the number of new uses to which it is constantly being put. The tree is found from the boundary of Mexico northward, and never very far from the coast, there being in some cases forests of this tree exclusively on the Coast Range.

Another Warning.

Waterbury, Conn., is suffering from what may almost be called an epidemic of typhoid fever, due to the contaminated milk served from a dairy farm that supplied part of the city with milk. The city engineer, a member of the health board, was one of the victims to whom the disease proved fatal. One of the daily papers, commenting on this, says:

"This man had labored long and earnestly in defense of the public health, so far as the removal of unfavorable conditions within the city limits was concerned, and as a member of the board of health his attention must have been called to many subjects in the field of sanitation that were not connected with drainage. But in the prime of life he has been cut off by poison sent to the city from a farm where the farmer himself lay ill of typhoid fever, and from which an employe had recently been taken to the city hospital, there to die of the same malady. If so well-informed a civil engineer and practical sanitarian as the late Mr. Weld was willing to use in his family the milk sent from a herd and a dairy farm that had not been subjected to sanitary inspection, we cannot expect that the average citizen will strive to protect himself under similar conditions. The frequent sanitary inspection of suburban dairy farms is required for the protection of the inhabitants of the cities in which milk from those farms is sold."

This is only another warning, adds *The Christian Union*, to every citizen. You may protect your property from burglars by bolts and bars, but the lives of those dearest to you, who have a right to look to you for protection, depend on your intelligence for their health, for their lives. Insist on public officers doing the work for which they are appointed; in every way see that your own home is conducted on such a basis as not to endanger public health. See that your neighbor does not endanger the health conditions of your own home, and these frequent public calamities will be avoided. They are preventable, and it is criminal carelessness to live under conditions that make them possible.



A REMARKABLE TRAIN LOAD OF REDWOOD LOGS IN CALIFORNIA.

SHIP railways appear to be growing in favor. In addition to the one now under construction across the Chignecto isthmus, comes a report concerning a similar project from Georgian Bay to Toronto, Canada, a distance of about seventy miles. This railway, if completed and successful, will, says the *Railway Review*, shorten the distance between Chicago and Lake Ontario some 600 miles. Mr. E. L. Corthell, of Chicago, who, it will be remembered, was intimately associated with Mr. James B. Eads, the projector of the Panama ship railway, is reported to be favorably impressed with the idea and to be ready to take an active interest in it. Modern engineering apparently delights in accomplishing the impossible, and it is not improbable that in the modern ship railway a new transportation element may be developed.

AN electrician says that just what takes place in the human organism to produce death from an electric current seems to be an unsolved problem. One of the theories sometimes advanced concerning it is that when a being suffers death from electric shock, it is a pure case of internal rupture or explosion from the generation of gas or vapor. In support of this view, the way in which telegraph poles are sometimes torn to pieces is referred to. The lightning follows the moist portion of the pole, which is the core or heart; in this case the moisture is vaporized, and an explosion occurs. The high resistance produces heat, the heat in turn steam, and the steam explosion.

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New British War Vessels.

The second class protected cruiser Pallas, which was laid down on July 1, 1889, was lately floated out of No. 4 Dock at Portsmouth. She is the first of the ships building at the dockyard under the Naval Defense Act, and has for sisters the Pearl, Philomel, and Phœbe, under construction at Pembroke and Devonport, and the five vessels—namely, the Pandora, Pelorus, Persian, Phœnix, and Psyche—which are in course of building by contract under arrangement with the Australian government for the purposes of colonial defense, and the names of which have been recently changed to the Catoomba, Mildura, Wallaroo, Taurango, and Ringarooma respectively. Being intended for service on stations where docking accommodation is available, the Pallas is destitute of copper sheathing, but has a steel bottom coated with the usual compositions to prevent corrosion and fouling. She measures 260 feet between perpendiculars, and has a breadth of 41 feet, a mean draught of 15 feet 6 inches, and a load displacement of 2,573 tons. The weight of the hull is 1,250 tons. A watertight steel deck extends throughout the entire length of the ship, whereby protection is afforded to the engines, boilers, magazines, etc., and which is supplemented by the coal bunkers. The hull is largely subdivided by watertight decks and bulkheads, so that a bilged compartment can be isolated at will. Special protection is provided for the fighting stations of the ship, as well as for the necessary instruments, telegraphs, etc., that would be required for maneuvering in action. The Pallas is to be provided with two sets of inverted direct-acting engines, for which steam at 155 lb. pressure will be supplied by four double-ended boilers. The indicated horse power at natural draught is 4,500, and with forced draught 7,500, the speed resulting being estimated at 16½ knots and 19 knots respectively. The continuous sea-going speed to be maintained on a four days' run is specified to be 14¾ knots under a natural draught horse power of 2,500. The coal capacity at load draught will be limited to 10 knots, will insure the vessel steaming a radius of not less than 4,800 knots.

The armament of the Pallas will consist of eight 4·7 inch and the same number of three-pounder quick-firing guns, in addition to smaller machine guns and the usual torpedo equipment. The total estimated cost of the ship, including £54,410 for propelling machinery and £7,597 for guns, is £150,186.

On July 1, the twin screw protected cruiser Phœbe was launched at Devonport dockyard. The Phœbe is of the Pandora type, the Philomel, building at Devonport, the Pallas, just launched at Portsmouth, and the Pearl, building at Pembroke, being sister ships. Five vessels of the same class are building at Newcastle-on-Tyne and Glasgow for the Australian government. The Pandora class of vessels is 265 feet long, 41 feet broad, with a displacement of 2,575 tons. The engines of the Phœbe have been constructed at Devonport. They are of 7,500 horse power and with forced draught should realize a speed of 19 knots. The Phœbe's armament consists of eight 4·7 inch and eight three-pounder quick-firing guns, one seven-pounder, four 0·45 inch five-barrel Nordenfelts, and twelve 14 inch Whitehead torpedoes. She has a coal-carrying capacity of 300 tons, enabling her to steam a distance of 6,000 knots at 10 knots.

The vessels of the British Mediterranean squadron recently enjoyed a full speed race over a five-mile course between Jaffa and Beyrout. The following ships took part: Victoria, Australia, Benbow, Phaeton, Dreadnought, and Colossus, while the Trafalgar, Temeraire, Edinburgh, and Agamemnon acted as umpires and did not compete. The Australia took the first place very easily, and in the course of five hours' run gained nearly four miles on the Benbow, which was second. The Victoria was third, followed by the Dreadnought, while the Phaeton and Colossus brought up the rear. The Australia averaged a speed of 16·5 knots, the Benbow 15·5, the Victoria 15, the Dreadnought 14·5, the Phaeton 14, and the Colossus about 13 knots.

Nickel-in-the-Slot Telephony.

A novel telephone station is being introduced in Connecticut. The instrument cannot be used unless a fee is paid. There are five slots in the machine for the reception of a nickel, ten cent piece, quarter, half dollar, and dollar respectively. These amounts cover the rates charged for telephoning to various places in and out of the State. To use the telephone it is first necessary to call up the central, as on an ordinary telephone. The objective point is then asked for, and when this is reached, the party who rings up is told to put the necessary fee in the slot. If five cents is dropped in the slot, it strikes a bell of a high note, once. Ten cents strikes a bell of the same note, twice. A quarter strikes a bell of a lower note, once. A half dollar strikes that bell twice, while a silver dollar strikes a very low tone "cathedral gong."

The Southern New England Telephone Company has arranged to place a large number of these instruments in Connecticut as rapidly as they can be furnished.

Subsidies for American Ships.

Two subsidy bills have lately passed the U. S. Senate and are now before the House of Representatives. If enacted, they are likely to have a most important influence in the development of American commerce and ship building. These bills provide for the payment of liberal subsidies to American vessels that engage in foreign trade; and additional subsidies to steamers that are employed to carry the United States mails.

In so far as the general principle is concerned of paying subsidies out of the public treasury, to private individuals, there can be no question it is wrong, and if long continued is corruptive and disastrous.

On the other hand, in the history of every nation exigences have arisen when as a matter of public expediency, for the immediate realization of great benefits to be secured in no other way, the grant of special subsidies for a limited period has proved in the highest degree advantageous.

Such an emergency it is claimed is now upon us. Our seaports and coasts are without adequate naval protection, while our foreign commerce is in a state of sad decline.

We have allowed other nations to monopolize the principal routes and vehicles of ocean commerce, and at the same time overshadow us with superior naval establishments. It is to be hoped we shall never have occasion to resort to hostilities with any nation. Still it is humiliating to feel that, in case of insult or attack, we have little or no means of naval offense or defense.

We see, in the examples of other nations, that the quickest and most satisfactory way to build up foreign commerce and provide an effective navy is to grant generous subsidies wherewith to stimulate and reward individuals who build and navigate ocean vessels. The experience of Britain during the past fifty years appears to show that the gains to the empire, in freights, in commerce, and in manufactures, have been at least a thousand millions for every million expended in subsidies. The public benefits of the system have far outweighed its admitted evils.

Let us hope that corresponding benefits will accrue to this country as a result of the new subsidy legislation now about to be inaugurated.

The Tonnage Subsidy bill, passed by the Senate, provides for the payment to any vessel of more than five hundred tons gross register, whether sail or steam, constructed and wholly owned by citizens of the United Sates, or registered pursuant to the laws thereof, and which shall be engaged in the foreign trade, plying between the ports of the United States and foreign ports, the sum of fifteen cents per gross registered ton for the first five hundred miles or fraction thereof sailed outward, and the same sum for the first 500 miles or fraction thereof sailed inward on any voyage or voyages; 15 cents per gross registered ton for the second 500 miles or fraction thereof sailed outward, and the same sum for the second 500 miles or fraction thereof sailed inward; and 30 cents per gross registered ton for each thousand miles thereafter, and pro rata for any distance sailed less than one thousand miles after the first thousand miles sailed, provided that the foreign port to which the voyage is made shall be distant more than seventy miles seaward from the Gulf boundary of the United States. The payments at the rate of 30 cents per ton, for each 1,000 miles sailed, are to continue for the term of ten years at that rate, and thereafter for another term of nine years at a reduction of three cents per ton each year upon each 1,000 miles sailed, and pro rata for any less distance.

No vessel is to be entitled to the benefits of this act unless its entire cargo shall be loaded at a port or ports of the United States, and discharged at one or more foreign ports, or shall be loaded at one or more foreign ports and discharged at a port or ports in the United States; nor shall a vessel be entitled to receive payment under this act unless it shall have freight on board at the time of sailing to the amount in tons weight or measurement of at least 25 per centum of the net registered tonnage, 2,240 pounds or forty cubic feet to make a ton of cargo. There is to be no discrimination between competing lines.

No vessels are to be entitled to the benefits of this act unless all the officers thereof shall be citizens of the United States, nor unless upon each departure from the United States the following proportion of the crew shall be citizens of the United States, to wit: During the first two years, one-sixth thereof; during the next three succeeding years, one-third thereof; and, during the remaining term of this act, at least one-half thereof; nor unless there be carried on vessels of less than one thousand tons gross register one native-born apprentice, and on vessels of one thousand tons and upward one such apprentice for each 1,000 tons or three-fourths fraction thereof. The government of the United States have the right during the time this act shall be in force to purchase or charter any vessels receiving the benefits of this act, at a price to be fixed by agreement with their owners or agents, or by the judgment of appraisers mutually selected in case of disagreement.

The Secretary of the Treasury is to fix the times and manner of payments, prescribe the vouchers, with forms of account and verifications, upon which payments shall be made, and shall adopt whatever regulations may be necessary to carry out the provisions of this act.

The Postal Subsidy bill authorizes the Postmaster-General to enter into contracts for a term of not less than five nor more than ten years in duration with American citizens for the carrying of mails on American steamships between ports of the United States and such ports in foreign countries (the Dominion of Canada excepted) as in his judgment will best subserve and promote the postal and commercial interests of the United States. Such contracts are to be made with the lowest responsible bidders, and the Postmaster-General is to have the right to reject all bids not in his opinion reasonable for the attaining of the purposes named.

The vessels are to be American-built steamships, owned and officered by American citizens in conformity with the existing laws, and upon each departure from the United States the following proportion of the crew shall be citizens of the United States, to wit: During the first two years of such contract for carrying the mails, one-fourth thereof; during the next three succeeding years, one-third thereof; and during the remaining time of the continuance of such contract, at least one-half thereof. They are to be constructed after the latest and most approved types, with all the modern improvements and appliances for ocean steamers. They are to be divided into four classes. The first class is to be iron or steel screw steamships, capable of maintaining a speed of twenty knots an hour at sea in ordinary weather, and of a gross registered tonnage of not less than 8,000 tons. No vessel except of the first class is to be accepted for the mail service between the United States and Great Britain. The second class is to be iron or steel steamships, capable of maintaining a speed of sixteen knots an hour at sea in ordinary weather, and of a gross registered tonnage of not less than 5,000 tons. The third class is to be iron or steel steamships, capable of maintaining a speed of fourteen knots an hour at sea in ordinary weather, and of a gross registered tonnage of not less than 2,500 tons. The fourth class is to be iron or steel or wooden steamships, capable of maintaining a speed of twelve knots an hour at sea in ordinary weather, and of a gross registered tonnage of not less than 1,500 tons.

NAVAL OFFICERS MAY SERVE.

The steamships of the first, second, and third classes are to be constructed with particular reference to prompt and economical conversion into auxiliary naval cruisers. The rate of compensation to be paid for such ocean mail service of the said first class ships is not to exceed the sum of $6 a mile, and for the second class ships $3 a mile, by the shortest practicable route, for each outward voyage; for the third class ships not to exceed $1.50 a mile, and for the fourth class ships $1 a mile, for actual number of miles required by the Post-Office Department to be traveled on each outward-bound voyage. Upon each of the vessels the United States is to be entitled to have transported free of charge a mail messenger whose duty it shall be to receive, sort, take in charge and deliver the mails to and from the United States, and who shall be provided with suitable room for the accommodation of himself and the mails.

Naval officers may volunteer for service on the vessels, and when accepted by the contractor or contractors, may be assigned to duty by the Secretary of the Navy, whenever in his opinion such assignment can be made without detriment to the service, and while in said employment they shall receive a furlough pay from the government, and such other conpensation from the contractor or contractors as may be agreed upon by the parties; provided that they shall only be required to perform such duties as appertain to the merchant service.

The vessels are to take as cadets or apprentices one American-born boy under twenty-one years of age for each 1,000 tons gross register, and one for each majority fraction thereof, who shall be educated in the duties of seamanship, rank as petty officers, and receive such pay for their services as may be reasonable.

The steamers may be taken and used by the United States as transports or cruisers upon payment to the owners of their fair actual value.

A Statue to an Inventor.

American inventors are beginning to be appreciated by the public as public benefactors, and monuments are gradually appearing in the public parks to commemorate their valuable services to mankind. In the chief park of Newark, N. J., may now be seen a newly erected statue of Seth Boyden, the inventor of the process of making patent leather, and that of making malleable iron castings, besides many important improvements in steam engines. It is said he made a large sum of money out of his inventions, but lost it in speculation. Although dying a poor man, he left a record rich with noble work behind him, and the people of Newark have done well in honoring his memory.

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THE SCIENTIFIC USE OF THE PHONOGRAPH.

BY GEO. M. HOPKINS.

Many of the experiments in sound commonly performed by the vocal organs, in connection with some mechanical device, may be carried on to advantage by the aid of the phonograph. When the mouth is used it is difficult to secure continuous or variable sounds without producing puffs of air, which are fatal to the experiment, whereas in the case of the phonograph these puffs are absent. Take for example the beautiful experiment of the vibrating soap film. It is almost impossible to produce continued vibrations by means of the vocal organs; but it is a simple matter to secure uniform results when the vibrations are produced by the phonograph.

To carry out this experiment in connection with the phonograph, it is necessary to first produce a record of the required sounds. A thistle tube, made in the form shown in Fig. 1, is used for holding the soap film. A beam of sunlight, or a parallel beam from an optical lantern, is thrown upon the film, and the reflected beam is passed through a lens of 6 or 8 inch focus, and received upon a white screen. As the phonograph imparts vibrations to the air in the thistle tube the soap film is vibrated, and gorgeous color effects in various figures are seen upon the screen.

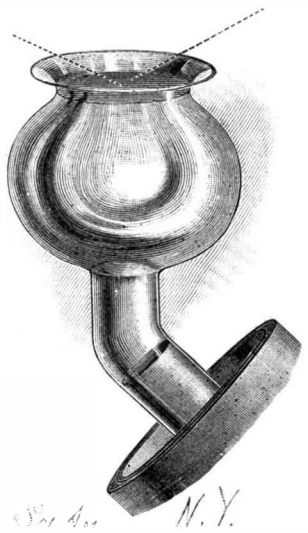

Fig. 1.—PROJECTION OF VIBRATING SOAP FILM.

A similar experiment is illustrated by Fig. 2. This is a modification of the opeidoscope. A thin membrane of goldbeater's skin or rubber is stretched over a wooden or metallic cell and secured by a winding of thread. To the center of the membrane is cemented a small thin mirror. The light is received and refleeted, as in the other case. When the membrane is vibrated, intricate bright figures appear on the screen, the figures varying with the character of the vibration.

Precious Stones in Arizona.

One day recently, upon falling in with Colonel Manuel Gomez, of Parita, a Mexican mining engineer, who has lately been traveling extensively in Arizona and Old Mexico, investigating the mineral resources of that part of the country in the interest of some Eastern and European capitalists, I asked him, says a writer in the *Star* newspaper, what truth there was in the report that precious stones in paying quantities could be found in Arizona. He said:

"I was not looking for precious stones, but I picked up some information about them, for I go on the principle that no sort of general information can do a man harm. My experience in Brazil, however, taught me that wherever there were precious stones to be found there was a much larger number of fairy stories afloat as to the value of the 'finds.' You know that precious stones are simply crystallizations, and, with the exception of the diamond, which is pure carbon, they are water formations, colored with some mineral or vegetable impregnations. Those found in Arizona are spinal rubies, sapphires, emeralds, turquoises, an excellent garnet, amethysts, and small pearls. The ruby has been found in large sizes up to fourteen carats, but much inferior to the Burman rubies. The sapphires, emeralds, and pearls are very small, and the amethyst crystals very large. They are often found in ants' nests in the deserts, as those industrious insects have a habit of carrying shining stones to their nests. Larger turquoises are found there than anywhere else, but very light in color. The majority of them are greenish, but many are light blue. The rubies, sapphires, and emeralds are corundums, and are generally found in a granite country. The pearls are found along with petrified clams and oysters, showing that the country has been, at some remote period, under water. I have been told by geologists that Arizona was the first land appearing above the waters in prehistoric ages.

"The turquoise is found in seams of an eighth of an inch to four inches in width. The Spaniards mined them at a depth of about thirty feet. There are turquoise mines in both New Mexico and Arizona, which have been long abandoned, and in which are found Indian hammers, made of stone, showing that the Indians worked them. The large turquoise set in the Spanish crown, and which is as large as a pigeon's egg, is supposed to have come from Arizona. Turquoises are very popular among the Indians, and a good sized perfect stone can generally be traded for a pony to some of the chiefs. About twelve years ago some unscrupulous Eastern man, finding that corundums are in the desert, got up a diamond excitement, scattered some small rough diamonds at certain points, and on the strength of the 'finds' organized a diamond mining company. He is said to have made money out of it, but the company didn't. The emeralds found in Arizona are of very good quality and very clear, but they are small.

"In the eastern part of the Territory, near where most of the gems are found, there is a petrified forest some eighteen hundred acres in extent, the major part of which seems to have been California redwood. There are a number of petrified trees lying about that locality that are a hundred feet long, and some are four feet thick at the butt. Where these trees are hollow, the inside is often coated with crystals—amethysts and topazes. Some of these are very large. The trees take a very high polish, and have been used for table tops and other ornamental purposes, but on account of their hardness, and the necessarily great expense of transportation and working, they are not used so much as their beauty would warrant."

Armor Plates.

In December last the Navy Department issued an advertisement and circular inviting steel manufacturers to submit armor plates for a competitive test to be held at the naval ordnance proving ground at Annapolis. Having failed to secure, in response to this advertisement, any armor plates of American manufacture, the department has decided to test the relative merits of three varieties of foreign armor plates, and accordingly three plates 10½ inches thick have been purchased abroad and will be tested by a board of naval officers some time next month. The first of these plates is a compound plate of the kind used in England, made by Cammell & Co. The second is a steel plate made by the Creusot Co., and of the kind adopted in certain Continental countries. The third is of an alloy of steel and nickel, which is reported to have shown remarkable resisting qualities on the proving ground at Creusot and in England. These plates will be attacked with forged steel shell of 6 and 8 caliber, fired with velocities of 2,075 and 1,850 f. s. respectively.

A WRINKLE IN SAWING.

A try square is not always at hand when it is desired to saw a stick, and when it is handy some mechanics prefer to work by "guess" than otherwise. When a bright straight saw is placed upon a stick or on the edge of a board, the reflection of the stick or board in the saw is sufficiently well defined to permit of placing the saw so that the reflected image coincides with the object reflected, forming a continuous straight line. If the sawing is done while the image and the stick are in line, the stick will be cut at right angles.

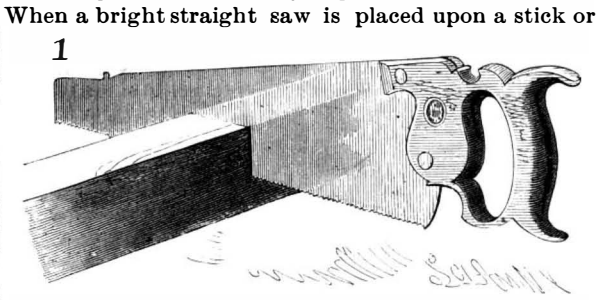

Fig. 1.—REFLECTION SUBSTITUTED FOR THE TRY SQUARE.

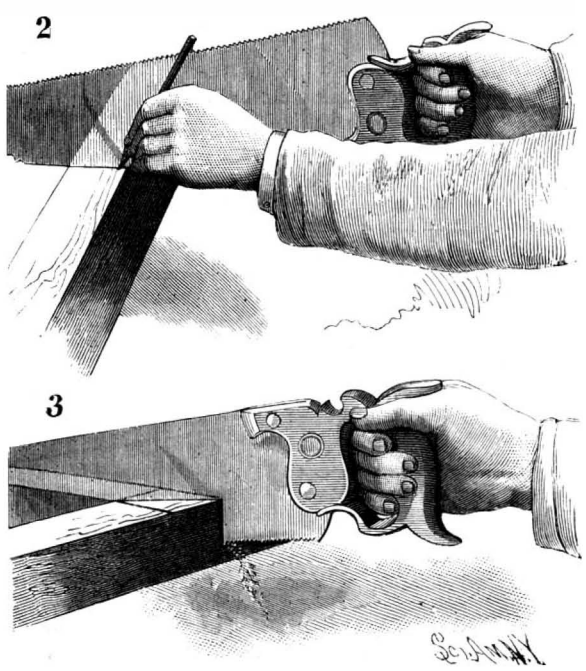

Fig. 2.—LAYING OUT WORK BY REFLECTION.
Fig. 3.—FORTY-FIVE DEGREE ANGLE BY REFLECTION.

It is obvious that a line may be drawn at right angles to the stick by arranging the saw as shown in Fig. 2. If, after forming this line, the saw be placed across the stick so that the line and its reflected image and the stick and its reflected image form a square, with the reflected image and the stick lying in the same plane, as shown in Fig. 3, the stick may be sawed at an angle of forty-five degrees, provided the saw is held in the same position relative to the stick.

Effect of Contraction and Expansion on Steam Boilers.

One of the severest tests of the strength of a steam boiler is due to the unequal expansion and contraction of its different parts, owing to the effects of changes in its temperature. In the case of flue or tubular boilers, in which the flues or tubes are more directly exposed to the influence of heat than the shell, the strain thus developed is tremendous, the tubes or flues, or their material, expanding lengthwise with a force calculated to tear the heads out of the boiler. Where the flues are placed very near the bottom of a boiler, in which case the pressure is all on the lower side of the heads and the plates that keep them together, it is not unusual for these plates to be ruptured or the seams sprung underneath, causing troublesome and often dangerous leaks.

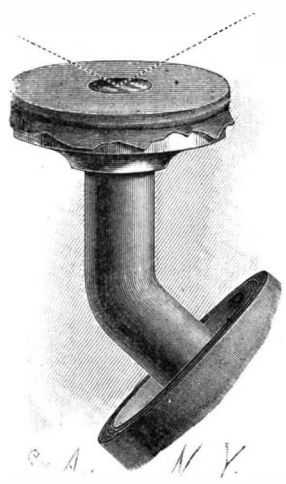

Fig. 2.—THE OPEIDOSCOPE APPLIED TO THE PHONOGRAPH.

The smaller the proportion of the surface of a boiler that is exposed to the heat, the more active will be the effect of the expanding and contracting forces, and in the case of some boilers, set more than half exposed to the influence of the atmosphere, the tremendous power exercised by the expansive heat of the fire below and the contraction due to the low temperature above are almost enough to tear the boiler to pieces.

It is the unequal expansion of shell and tubes, of the upper and lower shell, that really does more injury to a steam boiler than the expansion and contraction due to changes in pressure of steam; the leakage and cases of rupture that so often occur in the lower seams and along the bottom of horizontally fired boilers are unquestionably due to these causes, and in very many instances forced firing in getting up steam on first starting the boiler is to blame.

To avoid the injuries so often caused to boilers in this manner, it is necessary, a writer in the *Boston Journal of Commerce* wisely asserts, to exercise great care in raising steam in new boilers or those that have been blown out and allowed to cool down.

The fire should be raised moderately and gradually and the boiler moderately filled with water, so that the increase in the temperature may be gradual. In cooling off a boiler the same care must be exercised. The plan adopted by some engineers of turning a stream of cold water into the boiler as soon as it is emptied cannot be too severely condemned, nor should the furnace doors be too suddenly thrown open or any other proceeding taken that will result in suddenly lowering the boiler temperature, a rapid decrease in the heat being quite as bad for the safety and durability of the boiler as the immoderate and unequal increase above referred to.

The Growth of the Alternating System.

It was practically not until the spring of 1887 that the alternating current incandescent lighting system came into commercial operation in this country. At the February meeting of the National Electric Light Association in Philadelphia it was described and discussed as a thing quite rare and novel and of dubious value. Looking over the list of central stations on their alternating system just issued by the Westinghouse Electric Company, we find a detail of no fewer than 301 central stations, of a total generating capacity of 554,350 lamps of 16 c. p. or 886,960 lamps of 10 c. p. This is an enormous growth, and, of course, does not by any means represent all the alternating plants in the country. But even if it stood by itself, this list would be evidence of amazing development and would show beyond cavil that the alternating system had found a vast territory awaiting occupancy by it, and had already made a respectable start in filling that territory up. On a basis of about $30 per 16 c. p. light, this growth represents the handsome investment of not far short of $17,000,000 in these 301 central stations, for lamps, wiring, dynamos, and steam or water plant. —*Electrical Engineer.*

Eighty Miles an Hour.

A special train bearing 150 Pennsylvania editors was run on the 15th July from Baltimore to Washington at an extraordinarily fast gait. It left Baltimore at noon, and thirty-five minutes later had traveled forty-two miles and was in the Pennsylvania railroad station here.

The speed averaged 72 miles an hour, or allowing for starting and stopping, at least 80 miles for the greater part of the run.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING. — Hiram D. Layman, Little Rock, Ark. The coupling pin in this device has a trip extension, there being a latch for securing the pin in coupled position, while the link has a shaft keyed to it, with other novel features, the device obviating the necessity of brakemen going between cars, while it may be used to couple to an ordinary drawhead, or to receive the common link held in an ordinary drawhead.

CAR COUPLING. — Henry Gallager, Savannah, Ga. This invention relates to that class of devices known as "twin jaw" couplers, and is designed to be automatic in some of its operations, and to consist of a minimum number of simple parts.

AUTOMATIC AIR BRAKE. — George B. Williams, Portland, Oregon. This invention consists principally of a direct closed passage leading from the train pipe to the brake cylinder and adapted to be forced open by the train pipe pressure exerted on an auxiliary piston during emergency applications of the brakes, and to be thus held open so long as the pressure on the inner side of the auxiliary piston exceeds the pressure on its outer side.

Mechanical.

FINISHING EMERY WHEELS. — Frederick Kohule, Dayton, Ohio. This invention covers a method of finishing emery-coated wheels by applying a coating of glue and emery to the peripheral face of the wheel, and then revolving the wheel in contact with a heated cylinder, whereby the emery and glue are evenly spread and quickly dried.

MILLSTONE PICK. — Jacob W. Truax, Essex Junction, Vt. This is an improved article of manufacture, in which the head of the pick is formed with integral semi-elliptical jaws at its opposite ends, the rear walls of the oval openings forming abutments for the blades, making a simple and economical tool in which the blades may be conveniently inserted or removed.

LUBRICATING DEVICE. — J. A. McDowell-Guajardo, Philadelphia, Pa. This is a device for lubricating the top and bottom rollers of spinning, slubbing, and drawing frames, in such way that the covers of the rollers are protected from being soiled by the lubricant, thereby adding to their durability and promoting economy in the work.

Agricultural.

CORN PLANTER.—John K. Thompson, Arkansas City, Kansas. This machine consists of a novel construction and combination of parts providing means whereby the seed may be dropped from either box, or from both at the same time, and also for hilling the corn simultaneously with the planting, and in such manner that the hills will be fully and plainly visible.

Miscellaneous.

HEATING DRUM.—Genisa Ott, Scotia, Neb. This is a device to be applied to the pipe of an ordinary stove to utilize the heat, the heating drum consisting of an outer and an inner cylindrical casing, with a spiral flange between the two, with a damper and a disk door, whereby the hot currents are caused to pass through the drum by a long or short route.

STORE SERVICE APPARATUS.—Edward A. Rorke, Brooklyn, N. Y. This invention provides a means for transferring a carrier from a dispatch track to a return track where the ends of the tracks are in different vertical and horizontal planes, a switching track being employed adapted to be moved vertically and also horizontally, making a combined elevator and switch track.

WIRE AND PICKET FENCE MACHINE. —James Kelley, Richmond, Ind. This is a machine designed to automatically feed the picket between the wires, twisting the same in reverse direction at each edge of the picket, and feed the same forward, and embraces various novel features whereby the movement of the machine may be continuous, and will require the service of only one man or boy to run it.

WAY BILL. — Edward P. Campbell, New York City. This is a form designed to substitute all local and through way bills, and all local and joint manifests or invoices, obviating the necessity of rebilling, etc., at the junction points of the various roads or lines over which it passes, and thus facilitating accounting and auditing.

PRINTING TELEGRAPH. — George B. Scott, Lakewood, N. J. This printing telegraph is provided with a ratchet wheel and pawl arranged to be actuated by a magnet placed in the main circuit, or one of the magnets commonly used in printing telegraphs, the ratchet wheel being connected through the medium of a spring with the type wheel shaft, which is thus propelled by power derived from the impulses sent over the line.

SECTIONAL COAL TRUCK.—George A. Thompson and Daniel E. Harris, Brooklyn, N. Y. This is a truck or cart having tracks on its bottom and skids hinged to one end, which may be inclined and serve as track continuations, in combination with bins having each wheels that rest on the tracks, a folding tongue, a hopper bottom, and a sliding discharge gate.

GRAIN HULLER AND SCOURER. — Job Short, St. Louis, Mo. This is a machine in which the grain passes through and is hulled in an upper cylinder, passing thence to a lower cylinder, where roughened disks with teeth operate to complete its cleaning, which is finished by a spiral steel brush which conveys it to the final discharge pipe.

SPOOL HOLDER.—Silas G. Knight, St. John, Newfoundland. This is a rectangular bracket frame bent from a single piece of wire, in combination with a stiffening guard plate and a spring-securing pin, forming a simple and convenient device whereby spools may be supported and attached to the dress of the operator at any desired point.

COLLAR AND CUFF DRIER.—John G. Dixon, New York City. This invention covers an apparatus designed to bring currents of hot air in contact with the articles, so that no portion of the heated air will escape without bearing its proportion of moisture, and also to facilitate the handling of the goods, and the dampening of them preparatory to the ironing.

DRAUGHTING PATTERNS FOR GARMENTS.—Eugene E. O'Halloran, Waipawa, New Zealand. This is an apparatus to enable tailors to quickly produce in various shapes and dimensions patterns of suits in various sizes, and consists of a rectangular frame with slotted and graduated side bars, and adjustably secured graduated cross bars, an angular shaped diagonally arranged shoulder, with other novel features.

BODY VENTILATOR.—Joseph E. Butts, Hawthorn, Fla. This is an elastic support designed to be fitted to the body, and a half-rigid skeleton frame in jacket shape, connected by stays held from the support, whereby an air space is formed between the clothes and the body of the wearer, to keep the body at a proper temperature when subject to exposure in warm weather.

SHOE UPPER. — Vincenzo Andretta, New York City. This invention consists of a boot or shoe having its entire upper and tongue piece made without seam, and of one piece of leather, on a specially devised last having a tapering groove or depression from its upper part down to near the instep, with projecting flanges on opposite sides, whereby the front portion of the material will be formed into an expanding and contracting tongue.

TIE PLATE FOR BRUSH FILLINGS. — Samuel K. Hawkins, Elmira, N. Y. This is a plate designed to effectually tie the ends of the brush filling in position and permit the lower extremity of the filling to project outward beyond the perpendicular frame of the end of the brush, the plate being of novel construction.

PENCIL SHARPENER.—Walter J. Gill, Boston, Mass. Combined with a stock having a pencil rest or table on its top surface, is a roughened tablet and a chip-receiving box, with a detachable handle and a cutting blade so attached to the handle as to be adapted to shave a pencil point tapering by successive shearing cuts.

BOTTLE STOPPER.—Otto Eick, Philadelphia, Pa. This is a hinged cap through which passes a bolt supporting a flexible block on the under side of the cap, a cam lever being held on top of the cap and engaging the bolt to raise or lower it, to compress the flexible block on the under side of the cap in the mouth of the bottle.

GAME.—Philip Bosche, Cortland, N. Y. —This invention provides a toy base ball field by the manipulation of which a ball, block, or cube representing a player may be made to travel in accordance with certain rules around the field, or sometimes a globule of mercury and a single ball are employed in playing the game.

NEW BOOKS AND PUBLICATIONS.

OFFICIAL REPORTS OF VARIOUS DUTY TRIALS OF THE GASKILL PUMPING ENGINES. Holly Manufacturing Co., Lockport, N.Y. Buffalo, N. Y.: The Courier Company. 1890. Pp. 229.

We have already had occasion to notice the Gaskill pumping engine, the successor to the Holly engine. Illustrations of the engine, with tables of tests made upon it as running in different water works, are here given, showing its very high efficiency and the large amount of duty credited to it.

THE ELEMENTS OF MACHINE DESIGN. Part I. General principles, fastenings, and transmissive machinery. By W. Cawthorne Unwin. New edition, revised and enlarged. London: Longmans, Green & Co. New York. 1890. Pp. xvi, 459.

The subject of this book, as treated in its pages, is given in great detail to mathematical analyses, graphical development and mechanical and perspective drawing being called upon for its illustrations. It can safely be recommended to those desiring to bring out the highest class of machinery under the best auspices, as to the proper proportion of parts and shapes.

THE ART OF PAPER MAKING. A practical handbook of the manufacture of paper from rags, esparto, straw, and other fibrous materials. By Alexander Watt. London: Crosby Lockwood & Son. 1890. Pp. xi, 260.

The well known author of other works on technology here gives his attention to the manufacture of paper. While it is treated largely from an English standpoint, yet it is brought well abreast of modern practice, and its many illustrations, extensive table of contents, and index make it of value to all progressive paper makers. Several useful tables and a bibliography are included.

RAILROAD ENGINEER'S FIELD BOOK AND EXPLORER'S GUIDE. By H. C. Godwin. New York: John Wiley & Sons. 1890. Pp. xii, 358.

The type of book of which this is an example is well represented by it. The author describes it as his aim to supply a real want, viz., that of a field book which can be carried on the ground for reference at any time. He seems to have carried out his design very well, and by the addition of the necessary tables has made it a work that will be very useful for reference in road surveying.

SEMITIC PHILOSOPHY. Showing the ultimate social and scientific outcome of original Christianity in its conflict with surviving ancient heathenism. By Philip C. Friese. Chicago: S. C. Griggs & Company. 1890. Pp. 247.

PRACTICAL ELECTRICAL NOTES AND DEFINITIONS, FOR THE USE OF ENGINEERING STUDENTS AND PRACTICAL MEN. By W. Perren Maycock, associate member of the Institute of Electrical Engineers, instructor of electrical engineering at the Pitlake Institute, Croydon. Together with the rules and regulations to be observed in electrical installation work, as issued by the Institution of Electrical Engineers and the Phœnix Fire Office. With diagrams. E. & F. N. Spon, London and New York. 1889. Pp. 130. Price 60 cents.

LA SOIE AU POINT DE VUE SCIENTIFIQUE ET INDUSTRIEL. By Leo Vignon. Paris: Librairie J. B. Bailliere et Fils. 1890. Pp. 360.

The entire subject of silk treatment from the cocoon to the finished fabric is reviewed, and numerous illustrations, tables, and statistics give a peculiar value to the work as a standard. It will be recognized as a very able and valuable contribution to the art of silk raising.

A MANUAL OF PHARMACEUTICAL TESTING FOR THE MAN OF BUSINESS AND HIS ASSISTANTS. By Barnard S. Proctor. Published at the offices of the *Chemist and Druggist*, London, and at Melbourne and Sydney. 1890. Pp. vii, 176.

The principal tests required in the pharmacy for the man of business and his assistant, to take the wording of the title, are clearly given here by the author. Pharmacists as a rule are somewhat empirical in anything approaching analytical work, but the tests here given represent, very satisfactorily, the class of work required in daily practice.

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SCIENTIFIC AMERICAN
BUILDING EDITION.

JULY NUMBER.—(No. 57.)

TABLE OF CONTENTS.

1. Elegant colored photographic plate of the residence of Henry R. Towne, at Stamford, Conn. H. H. Holly, of New York, architect. Perspective elevation, floor plans, sheet of details, etc. Cost $20,000.
2. Plate in colors of a dwelling at Tremont, N. Y. Floor plans, perspective elevation, sheet of details, etc. Cost $6,000.
3. Perspective elevation and floor plans of a residence at Monclair, N. J. J. C. Cady, of New York, architect. Cost complete $10,000.
4. Photographic view and floor plans of a residence at West Brooklyn, N. Y. Cost $4,500.
5. A cottage at Dunwoodie, N. Y. Floor plans and perspective elevations. Cost $5,000 complete.
6. A dwelling at Holyoke, Mass. Perspective and floor plans. Cost complete $5,500.
7. Sketch of a residence at Surbiton.
8. Design for a one story house to cost about $1,000.
9. Engravings representing the exterior and plan of a large piggery.
10. A dwelling erected for Mr. C. D. Danforth, Yonkers, N. Y. Floor plans and perspective. Cost $9,000 complete.
11. Photographic perspective view and floor plans of a neat and desirable cottage recently erected at Griswold, Iowa, from plans and perspective published in the SCIENTIFIC AMERICAN. Cost $1,075.
12. A handsome residence at Springfield, Mass., erected for Mr. E. W. Shattuck. Perspective and floor plans. Cost $15,000.
13. Floor plans and photographic perspective of several cottages erected for the late Hon. Chas. Crary, at Chester Hill, Mount Vernon, N. Y. Cost $4,000 each complete. Mr. J. C. Brown, of Mount Vernon, architect.
14. Sketch of a chapel and village hall. Estimated cost $20,000.
15. Page engraving of the Ripon Cathedral, Yorkshire, England.
16. Miscellaneous contents: Steam and hot water heating.—The garden.—European health resorts. —Fireproof paint.—Testing well water for sewage. —The carpenter.—Fire clay in Montana.—The Spence hot water heater, illustrated.—Improved sliding blinds, illustrated. — Prepared building paper. — An improved separator and trap for steam boilers, illustrated. — Lyle's storm and screen door, illustrated.—A sheet copper statue thirty-five feet high, illustrated.—A boiler for greenhouses, dwellings, etc., illustrated.—An efficient ventilating fan, illustrated.—An improved door hanger, illustrated. — Taste in selecting paint.

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Acme engine, 1 to 5 H. P. See adv. next issue.

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Best Ice and Refrigerating Machines made by David Boyle, Chicago, Ill. 155 machines in satisfactory use.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 13.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Billings' Double-acting Ratchet Drills. Drop Forgings. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

Wanted—Bids for the manufacture of a large number of time-stamps. Address "New Patent," care Scientific American, New York.

First-class Marine Draughtsman wanted. Give reference and salary expected. F. W. Wheeler & Co., ship builders, West Bay City, Mich.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

English tanned walrus, hippopotamus, giraffe, elephant and buffalo leather for polishing metals. All kinds mfrs.' supplies. Greene, Tweed & Co., 83 Chambers St., N. Y.

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Britten's "Watch and Clockmakers' Handbook, Dictionary, and Guide." Seventh edition. Copiously illustrated. 436 pages. $2.00. E. & F. N. Spon, 12 Cortlandt St., New York.

The valuable patent on umbrella folding table, illustrated on page 51, is for sale. Patent issued July 29, 1890. For particulars address A. J. Delavigne, 119 Barracks St., New Orleans, La.

A business man who has visited nearly every town in the United States desires an agency for manufacturers or others having goods or machinery for sale. References. Address W. Y., box 132, Cheshire, Conn.

To make artistic pictures, read "Naturalistic Photography for Students of the Art." By P. H. Emerson. Second edition. 313 pages. $2.00. E. & F. N. Spon, 12 Cortlandt St., New York.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2330) J. E. C. asks: Is there any paint that will stand soap and water, to be used for advertising on window glass? A. Good linseed oil and white lead give a basis for a paint that will stand. Any paint will gradually succumb to the friction and rubbing incidental to washing. Use care in cleaning the glass.

(2331) D. & G. write: We have made a dynamo as per instructions in SUPPLEMENT, No. 600, and wish to ask the following questions: 1. In Fig. 1 (perspective view) the field magnet wires are numbered. Is No. 1 on leg A, the outside end of the first coil wound? No. 2 the second, and so on? A. Yes. 2. Is No. 8 on leg B the outside end of first coil? No. 7 the second coil wound, and so on? A. Leg B is wound in the same manner as leg A, 1 being the first coil, 2 the second, and so on. 3. On page 9588, lower part of right hand column, it reads (to connect as shunt): "Terminal 1 of leg A is connected with one of the commutator brushes, 2 is connected with 5, 3 with 6, and 4 with 7;" does this mean that all the above numbers are on leg A? A. Yes. 4. Resistance must be placed between one of the terminals of magnet and the commutator brush. Does this mean to place it between one of the rods that run to top of field magnets and the brush to which it connects? A. This resistance may be inserted in any part of the field magnet circuit. 5. Will the machine run as well in either direction connected as a shunt machine, provided the brushes are arranged to run in such direction? A. Yes; provided suitable switches are furnished for changing the current.

(2332) W. F. O. asks for a recipe for making mahogany stain, something that could be applied to wood without graining. A. Use a decoction of logwood, 2 ounces to the pint of water, containing ½ ounce chloride of barium.

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(2333) G. R. L. asks for a receipt for a liquid stove polish that will dry quickly and leave a bright polish. A. Mix 2 parts copperas, 1 part powdered bone black, and 1 part black lead with enough water to give proper consistency (like thick cream). Two applications are to be recommended.

(2334) H. R. B. asks how to make the flexible pad composition that is sold for notes. A. Dissolve the best quality of glue in water, and add of glycerine one-fifth the weight of the dry glue.

(2335) W. P. S. asks: What is the best cement for fastening leather to wood? Is leather to cover a box tightly put on while wet? A. Use a mixture of flour paste and glue. Apply the leather dry.

(2336) A. G. E. asks how much hydrogen gas is liberated by one pound of sulphuric acid in water acting on iron. A. One forty-ninth pound, measuring 6673 cubic inches. This supposes pure sulphuric acid or oil of vitriol to be used.

(2337) E. E. R. asks: 1. Can you give me any receipt for perfume [so it will mix intimately with melted paraffine and the perfume be lasting when the paraffine is cold and cut into tablets? I have two receipts now, one the odor is not agreeable, and the other, while pleasant, does not last. A. Oil of bergamot 4 parts, do. lavender 2 parts, do. cloves 1 part, do. neroli ½ part. Many others could be given. 2. Can you not give me a receipt for making sachet powder to put in sachet bags, to perfume drawers, etc.? A. There are many formulas. The following is for patchouly: Ground patchouly herb 2 pounds, do. rhodium ¼ pound, do. orris root 1 pound, do. benzoin ¼ pound, oil of patchouly 1 drachm, oil of rose 20 drops. 3. I want a receipt both in liquid and dry state (if possible) to make an ink eraser. I use chloride of lime dissolved in water and acetic acid, but the mixture loses its strength, when bottle has been used several times, from exposure to the air, and renders it not very desirable as an article of commerce, causing buyers to pronounce it a fraud. A. Use oxalic and citric acids mixed, or use bin oxalate of potash. These are solids, but can be used in solution.

(2338) R. McK. asks: 1. What is the best thing for the removal of freckles? A. Nothing really efficacious except corrosive applications can be given. Even such are apt to have only a transitory effect. 2. What acid is used for writing that is invisible when written, but which develops upon being heated? A. Dilute sulphuric acid with a gold or quill pen.

(2339) T. C. B. writes: I have a pound or so of protosulphate of iron which has been exposed to the air for some time, and which has become incrusted with a white powder. Does this impair the use of the crystals, and if so in what manner? A. The white color may only indicate the loss of water of crystallization. It does not impair the substance except as it changes its weight. It may, however, be accompanied by oxidation, which would form basic and insoluble salts, requiring addition of acid for solution.

(2340) D. J. R. asks for a good receipt for a black walnut stain. A. *a.* A decoction of green walnut husks dried and boiled in lye is recommended. *b.* Dragon's blood and lampblack mixed in wood alcohol may be used, well rubbed into the wood. *c.* One gallon strong vinegar, 1 pound dry burnt umber, ½ pound fine rose pink, ½ pound dry burnt Vandyke brown. After mixing and standing for a day it is ready for use. Apply with a sponge.

(2341) P. W. asks how to make a substance which when burnt will give forth a strong but pleasant odor or perfume, and if burnt in a room will perfume the room for two or three hours. A. Use following ingredients in powder: Charcoal 2 pounds, olibanum ½ pound, Tonquin beans, gum benzoin, allspice, cinnamon, cloves, and nitrate of potash ¼ pound of each. Make into a mass with gum tragacanth in solution in water and form in moulds or with the fingers. Several others could be given.

(2342) E. D. writes: In your issue of May 17, 1890, in answer to question 2179 (J. L. S.), you give a formula for removal of soot stains from granite. I tried it, and it removed the soot stains, but left a stain of light green, probably from the sulphate of copper. What will remove that? A. Try ammonia on a small portion. If it turns it blue, copper is present, and sponging with ammonia will tend to remove it. Experiment on a small portion to test the efficacy of the treatment. Weak muriatic acid should also be effectual, and might very properly be used as a second application to follow the ammonia.

(2344) Phil wood writes: 1. I noticed in an old SCIENTIFIC AMERICAN that a windmill would not do to run a dynamo, on account of its fluctuating motion. If the windmill was so governed that it would run at a uniform rate, would it do to run a dynamo? A. Yes; if the mill could be kept going at a high enough rate of speed. 2. If the wind should suddenly fall away so that the mill stopped entirely, would it harm the material working of the dynamo? A. The dynamos would cease to develop electric energy. The current would stop. No harm would be done. 3. What are the best works on electroplating that you would advise a beginner to get and which would explain everything in clear language? A. Read our SUPPLEMENTS, treating of this subject, especially No. 310.

(2345) D. B. asks if honey bees make honey from flowers, or if they make only what is called bee bread from flowers. A. Bees extract honey from flowers, taking it into their stomachs and disgorging it into comb in the hives. The hairs upon their body accumulate pollen, which the bee pours into little pellets, and which is called "bee bread." The adults eat honey, the larvæ eat "bee bread."

(2346) I. S. asks: 1. What is the cause and cure, in the case of young persons in apparent perfect health, sound teeth, of temperate, abstemious, industrious habits, addicted to no abuse, exhaling a disagreeable breath? A. Possibly dyspepsia. A physician should be consulted. 2. We constantly see the most opposite opinions in public journals, from equally authoritative sources, of the "carp"—praise and utter condemnation. What is the fact? A. The quality varies with the circumstances of its cultivation and environment. Hence widely different opinions have been expressed concerning it. It should furnish an excellent food if properly treated. 3. Did the so-called "German carp" originate only in Germany? A. It originated in Central Asia, was introduced into Europe some centuries ago, and came to the United States via Germany. The whole subject of its history, qualities, and cultivation is admirably given in a paper in our SUPPLEMENT, No. 420.

(2347) T. E. M. asks: 1. About how many volts would it take to kill a rat? A. The voltage required to kill a rat might for the alternating current be put at 200 or 300 volts. It is uncertain, and will vary with circumstances. 2. How is bottled soda water made that is sold by confectioners? A. By charging the proper mixture of sirup and water with carbonic acid gas by special apparatus.

(2348) W. J. M. asks: How can I cut off the head and neck of a large glass bottle such as chemicals are put in, without too much expense? It is two feet high and nearly as much in diameter, and I wish it cut as smooth as possible. A. There is a certain amount of risk in doing this. File a notch on the line and hold a red hot wire against the glass, moving it back and forth along the line for the cut. When a crack starts you can lead it around with the hot wire. Tie a string or spring a rubber band around the bottle as a mark. Success is doubtful.

(2349) C. E. E. asks how to transfer a woodcut picture from the paper to the glass of a lantern slide without the aid of sensitized plates. A. Soak the picture in water. Varnish the plate of glass with dammar varnish or Canada balsam. When just "tacky," remove the picture from the water and place it face downward on the varnish side of the glass, gently rub it on, seeing that no air bubbles are left between paper and varnished glass. Let it dry until perfectly hard. Then with the wet finger tip rub off the paper until little more than the design is left. Varnish a second time and allow to dry. The result is apt to be either too pale or too obscure.

(2350) A. A. D. writes: I would like to have a receipt for a glossy black ink, one that would be suitable for writing on labels which are exposed to sunlight. I have tried many of the formulæ which have been published, but the inks soon fade. A. Use best China ink rubbed up in a solution of shellac in borax water.

(2351) W. A. A. asks if anything can be added to silicate of soda (water glass) to render it practically insoluble after it has once become set. A. Nothing of the sort is known. 2. Can anything be added to make it more waterproof when worked as a varnish? A. No. 3. Do you know of any cheap flexible cement that does not contain rubber or rubber or gutta percha? A. Not that is of any value. 4. Has the evolution of hydrogen gas from water by electrolysis ever been made of practical use as a heat-producing agent? Why could it not be done? Could not the electric current be supplied by a dynamo? Would it be necessary to acidulate the water? A. No. It is absurd to attempt it, as the original heat energy expended in driving the dynamo will exceed by far that supplied by combustion of the hydrogen. The water must be acidulated.

(2352) T. D. G. asks: 1. What is the remedy for perspiration of a disagreeable odor? I understand it is caused by the presence of some peculiar acid in the blood or circulatory system. Can the disagreeable odor be removed without effecting the amount of perspiration? What will do it? A. The cause cannot be broadly stated. A physician should be consulted for each case. The following powder is a useful local application (for external use only): Subnitrate of bismuth and salicylic acid of each 1 part, starch powder 2 parts. 2. Is hard water considered more healthful than soft water? What is the best method for rendering hard water soft for washing purposes? A. Soft water is considered the best and most healthful. Hardness may be due to several causes. If caused by the presence of bicarbonate of lime, boiling will remove it.

(2353) X. X. asks for any cheap and practical method of keeping milk, butter, etc., cool without ice, either by evaporation or otherwise. A. By placing the article in a metallic vessel wrapped with cloths and kept wet, a slight cooling will be effected, especially on a dry and windy day.

(2354) H. W. E. D. asks: What is the name of the skin you find inclosed, and where it can be purchased. A. It appears to be gold beater's skin, and is sold by druggists.

(2355) R. A. asks what shape a base ball curver is, and what it is made of. A. The base ball is curved by the pitcher, without any appliance. The subject has been discussed in this journal, with illustrations and explanations of the position of hand, body, etc. Attempts have been made to invent an apparatus for the hand, but have had little or no success.

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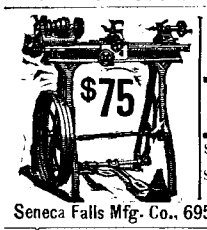

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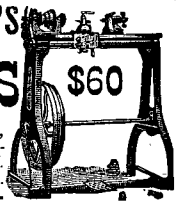

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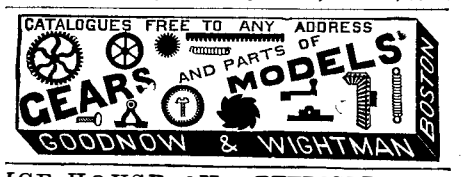

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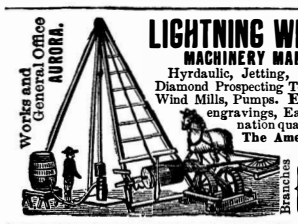

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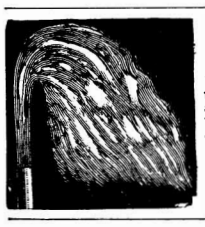

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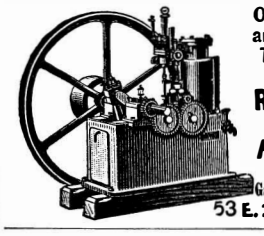

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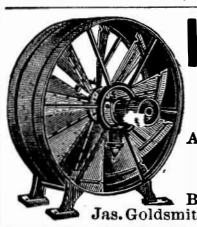

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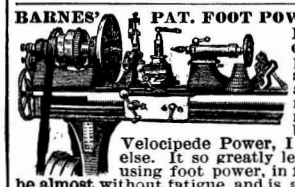

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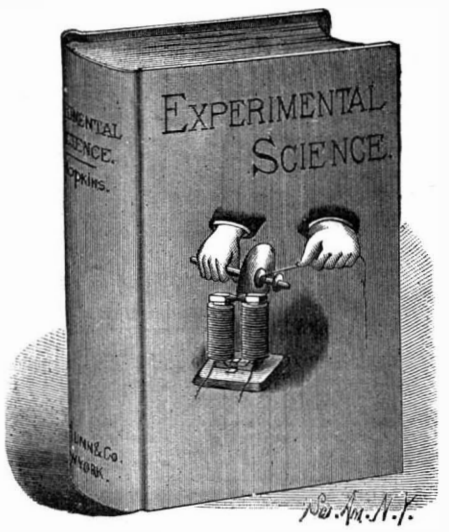

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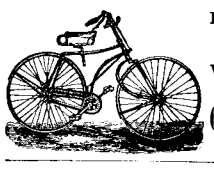

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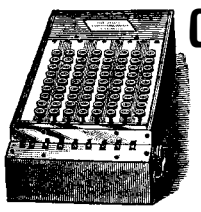

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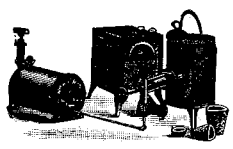

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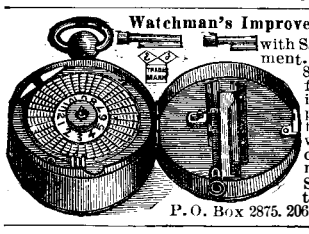

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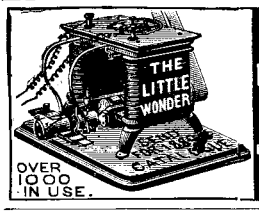

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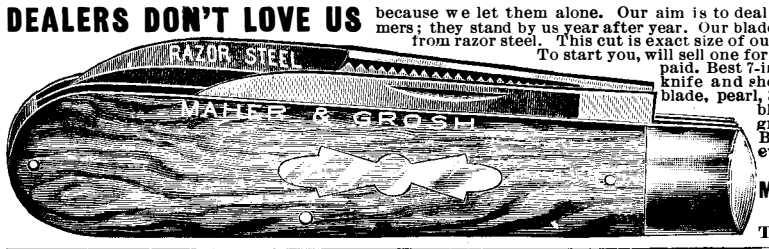

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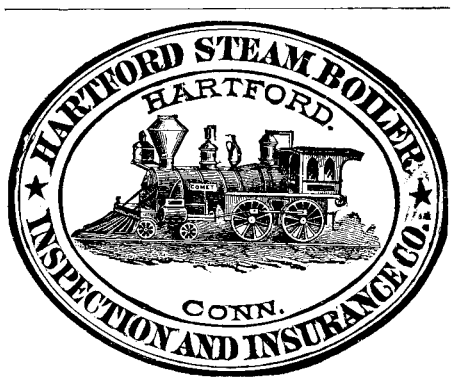

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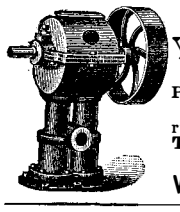

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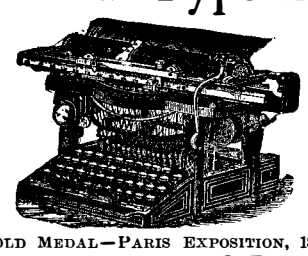

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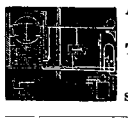

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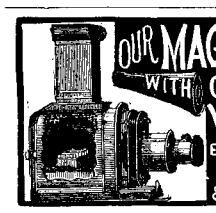

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